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CONTENTS.

LIST OF PLATES.

NOTES ON THE GERMAN SIEGE ARTILLERY AND 4-GUN FIELD BATTERIES, 1895.

BY

MAJOR H. C. C. D. SIMPSON, R.A.

The recent extensive organization of 4-Gun Field Batteries on our Home Establishment, and the contemplated administration as a distinct branch of our Siege and Heavy Artillery, may I hope be a sufficient excuse for bringing these few notes to the notice of my brother officers. They are collected from the diary of a tour made this autumn on the Rhine and in the Province of Nassau, during which I had an opportunity of inspecting the Fortress of Ehrenbreitstein, and of witnessing the Field Artillery operations at the Autumn Manœuvres of the 21st German (Frankfort) Division.

Ehrenbreitstein ("the broad stone of honour"), called the Gibraltar of the Rhine, situated on its right bank, constitutes a part of the fortifications of Coblentz commanding the junction of the Moselle and Rhine rivers, and is nearly 400 feet above the latter. Since the acquisition of Metz it has lost a good deal of its importance, but in it is one of the largest mobilization arsenals of the German army.

Its present garrison consists of the 9th Battalion Foot Artillery, formerly at Cologne.

I first inspected the barrack rooms which seemed neatly kept. The iron cots were arranged in two tiers around the walls like the berths of a cabin. The carbines were placed in racks in a sort of outer room or hall, with each man's name entered on a card above his carbine.

I then saw the men drilling at 15 cm [1] guns and howitzers. The directions were somewhat similar to ours, and each gunner was required to repeat the instructions of the Under Officer after each stage of the drill.

The men were fine sturdy fellows, averaging 5 ft. 6 in. in height. The ascent to the drill grounds is very steep, and sentries confront one at every turn. One parade ground is apparently for infantry drills, and the other for artillery exercises. Round the sides of the square

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[1] 9 cm = 3·5 inches.
12 cm = 4·7 "
13 cm = 5·1 "
15 cm = 5·9 "
21 cm = 8·2 "

constituting the latter are numerous drill sheds, on the outer sides of which are targets painted to represent German soldiers. On the land side of this spacious parade ground, at the top of the fortress, are extensive entrenchments, in which were mounted eight 15 cm guns on overbank carriages, and six heavy 13 cm pieces on the ordinary garrison standing carriages.

These guns were grouped in couples in the same emplacement, and on the flank of each group was built into the parapet a "crow's nest" for the "observer."

When not in use these guns were covered with a wooden cradle, over which was thrown a tarpaulin.

In the square were parked sixteen 15 cm howitzers with limbers fitted for pole draught.

A battalion of Foot Artillery consists of 4 companies, with a regimental staff of 1 Lieut.-Colonel, 1 Adjutant, three other junior officers and some staff artificers attached.

On mobilization a battalion forms in addition one park company which takes ten days to mobilize and is practically of the same strength as an ordinary company. This latter on a peace footing is of the following strength:—1 Captain, 3 Lieutenants or 2nd Lieutenants, 1 Serjeant-Major, 1 vice ditto, 1 Ensign, 4 Sergeants, 4 Sergeant Artificers, 11 Under Officers, 10 Bombardiers, 13 Acting-Bombardiers, 2 Buglers, and 70 Gunners—total 119 all ranks, normal footing. On mobilization the number of gunners is increased to 160.

All the battalions told off to the land forts would work, when required on active service, the siege parks and Heavy Artillery accompanying the force engaged in active operations, whilst it is understood that their place on the forts would be taken by Landwehr battalions.

The siege parks, of which there are three of four sections each in peace divided amongst the twelve principal fortresses, and including an "Abtheilung" of 4 park ammunition columns to each section, include the following pieces of ordnance:—

24	heavy 12 cm guns.	
12	short 15 cm guns.	
6	belted 15 cm guns.	
6	21 cm rifled mortars (howitzers).	
6	15 cm " " "	
6	9 cm " " "	
Total 60	pieces.	

For each of these is supplied the following ammunition:—

Rounds.	
1,000 common shell 200 shrapnel "	for each of heavy 12 cm or 15 cm belted guns.
1,000 common shell 100 shrapnel "	for each short 15 cm gun.
1,000	double shell for each 15 cm and 21 cm mortar.
100	common shell for each 9 cm mortar.
50	chilled shot for armour-piercing are also supplied for each 15 cm belted gun.

In addition to the above and also divided amongst the fortresses are the following :—

(1). Two reserve siege parks of the same composition as the preceding, but formed in part of the guns detailed as armament of the fortress with no ammunition columns.

(2). Two special siege parks which would march with the field army to bombard barrier forts, or be employed as batteries of position, each park being composed of forty guns and an "Abtheilung" of four park ammunition columns. The ordnance of these parks is made up of twelve heavy 12 cm guns, twenty short 15 cm guns, and eight 21 cm rifled mortars (howitzers), with a supply of 1000 common shell and 200 shrapnel for each gun and 1000 shell for each mortar.

(3). Three reserve sections each of 24 guns, viz :—twelve short 21 cm or twelve heavy 12 cm bronze guns and twelve heavy 9 cm bronze guns, with 1000 common and 200 shrapnel shell for the 9 and 12 cm guns and 1000 common shell for the 21 cm guns

To each section of a siege park or special siege parks would be attached a Foot Artillery Regiment of two battalions (about 56 officers and 2200 N.C.O.'s and men), with two mobilized Park Companies.

A special staff is formed for each park, and it is probable that the Inspectors of Foot Artillery and their staffs would take charge of the siege parks, whilst the staff of the regiment attached would perform the same duties for the special and reserve parks.

The Park Ammunition Columns would each have 1 Captain, 1 2nd Lieutenant, 1 Sergt.-Major, 2 Sergeants, 7 Under Officers, 8 Lance-Corporals, 80 Train Drivers, 1 Farrier, 16 riding and 164 draught horses, and 40 four-horsed ammunition wagons.

The German Siege Guns are all of hard bronze and breech-loading. (*See table A*).

I may state that a German artillery officer informed me that in his opinion the mobilization of the units referred to in this paper would not be fully completed with the ease that a study of the regulations might lead one to imply, especially in the formation of the Siege Train units. Having assisted as an Acting Company Commander in the formation of a temporary Siege Train Company in India, and as Adjutant in the conversion to Heavy Position Artillery of a Volunteer Artillery Battalion, I quite realized the force of his conjectures.

The special uses of each of these siege guns is as follows :—

9 cm heavy gun.—To fire at *personnel*, reply to the pieces of the mobile defence, fire on sap heads, and enfilade counter approaches. It may also be used for dismounting guns, destroying sand-bag embrasures, etc. when it is inconvenient to bring heavier guns to bear. At ranges under 800 yards it has given good results against guns behind blinded embrasures. It is also employed to bring shrapnel fire to bear on the enemy's works and to annoy parties repairing damages in the defence works.

12 cm heavy gun (*see foot note to table A*).—This gun is used to bring an accurate fire to bear at long ranges. During the first stages of a

siege it is used to oppose the enemy's guns by shrapnel fire at long ranges, and, later, at ranges below 1650 yards, to dismount guns and destroy light parapets or walls of ordinary thickness, or for bombardment. It may be substituted for the belted 15 cm gun if difficulties of transport prevent the latter from being used.

Short 15 cm gun (*see foot note to table A*).—Principally used for indirect fire to destroy earth or stone obstacles. It gives good results against detached walls with angles of descent of 24°, and remaining velocity of 1080 f.s. It is used also for enfilade fire at 2000 yards range and over, and against non-blinded gun emplacements at 1650 to 2200 yards. Up to 1200 yards it is used for dismounting guns, and gives good results with shrapnel against men behind cover, although the angles of descent are great. It is employed also for bombardments, and generally speaking in the 1st and 2nd Artillery Positions.

Belted 15 cm gun.—Its principal uses are for breaching at long ranges, dismounting guns up to 1650 yards, bombardment, and shrapnel fire, which latter is very efficacious at long ranges. It fires also armour-piercing projectiles, and is generally used in the 1st Artillery Position.

Short 21 cm gun.—This gun is principally used for breaching at short ranges when the 15 cm projectiles are not sufficiently powerful, *i.e.* against strong masonry with large angles of descent, and at ranges up to 2300 yards. It is used in the 2nd Artillery Position.

9 cm mortar.—Used against *personnel* and *matériel* at ranges from 500 to 1500 yards. The greatest effect is obtained with powder charges of from $4\frac{1}{2}$ to $5\frac{1}{4}$ oz., with angles of elevation from 15° to 25° corresponding to ranges of from 660 to 1320 yards. Specially used for enfilade fire, and of greatest effect when the shells are exploded against resisting objects. Principally used in the 2nd Artillery Position, and in Siege Batteries where a massed fire can be delivered. Platforms are not necessary but the carriage must be as nearly horizontal as possible.

15 cm mortar (*see foot note to table A*).—This piece is principally employed for long range high angle fire up to ranges of 2250. It can search the interior of works at medium and long ranges, fire against blinded guns, destroy platforms and render communications in general impossible. It is principally used in the 2nd Artillery Position.

21 cm mortar.—Used for destroying casemates, escarps, traverses, ramps, &c., and for general purposes of bombardment. It is principally employed in the 1st Artillery Position, and its most effective range is about 2200 yards.

Carriages.—The carriages at present in the service for the 9, 12, 15 cm short and belted, and 21 cm guns are some of wood and some of iron. A certain proportion are fitted with arrangements for overbank fire. The carriages for the 9 and 15 cm mortars are similar to our mortar carriages, although the pieces themselves are of course B.L. Those for the 21 cm mortars are of iron, and similar to our 8-in. howitzer carriages.

As already stated in a translation published in the "Proceedings" last April, a somewhat comprehensive employment of Heavy Batteries with an army in the field, on a similar principle to our Heavy Batteries in

India, is under trial, and the number of teams allotted for this purpose has been lately increased, but I have nothing to add to the details given in the paper referred to, all data not being yet absolutely settled, no batteries of this kind were employed in this year's manœuvres. It will be seen from the preceding that a German Siege Train Unit consists of 10 companies and 60 pieces of ordnance presenting a marked contrast to our modest requirements of 4 companies and 16 pieces. There is a tendency in all European nations to make a greater use of their Foot Artillery for field operations than has hitherto been the custom. Perhaps it would be as well if we occasionally turned our eyes from the sea towards the land, and afforded greater opportunities to our Regular and Militia Garrison Artillery for studying the working and *rôle* of movable armaments. At present it seems limited to the Volunteer Position Artillery, and three or four Siege Companies. At the Head Quarters of each Regiment of German Foot Artillery is a small bugle band. Would it not be possible by reducing our Mounted Band Establishment to have similar small bands at our large Garrison Artillery Stations, such as Portsmouth, Plymouth, Dover, and our Mediterranean Fortresses?

FIELD ARTILLERY.

The three "Abtheilungen" of the 27th Regiment Field Artillery I saw were attached to the 21st or Frankfort Division, and consisted each of three 4-gun batteries without wagons. The regiment forms one of the three constituting the Field Artillery Brigade of the XI. Army Corps and rendered distinguished service in 1870. The peace strength of a German 4-gun battery is 1 Captain, 3 Lieutenants or 2nd Lieutenants, 1 Sergt.-Major, 1 vice Sergt.-Major, 1 Ensign, 4 Sergeants, 10 Under Officers, 2 Trumpeters, 4 Bombardiers, 7 Acting-Bombardiers, and 69 Gunners (of whom 23 act as Drivers), 16 troop riding horses, 24 draught, 4 spare, and 3 "krümper" horses. The Captain has a charger allowed him, but the Lieutenants are mounted on troop horses. The Staff of a Field Artillery "Abtheilung" is 1 Major Commanding, 1 2nd Lieutenant as Adjutant *distinct from Battery Establishments* (as he should be with us), 2 Under Officers as Clerks, a Medical Officer, a Paymaster, a Veterinary Surgeon, and 4 riding horses.

On mobilization the following would be required to complete one of these batteries to war establishment, viz:—1 Lieutenant, 1 Trumpeter, 75 Gunners and Drivers, 13 riding and 92 draught and spare horses, 2 guns, and about 9 6-horsed carriages. The chief difficulty in the mobilization of these batteries lies in the supply of horses and it is considered that it would take at least seven days to complete them for service. As regards the extra guns and ammunition wagons required, each battery maintains in peace, either with it or at a neighbouring Artillery Depôt, the full complementary equipment.

As is doubtless well known to many readers of this paper the field gun of the German service is not yet General Wille's ideal weapon, of which we have all heard so much, and as yet seen so little approaching the same. It is the so-called 9 cm by Krupp, a B.L. single cylinder pneumatic wedge gun, and is a steel tube strengthened for half its length by steel hoops.

DATA OF 9 cm (3·5-IN.) GUN.

Length of gun, ...	82·679″.
Length of bore, ...	73·43″.
Calibre, ...	3·46″.
Number of grooves, ...	24.
Twist, ...	1 in 50.
Weight, ...	8 cwt. 3 qrs. 12 lbs.
Ordinary powder charge,... ...	3 lbs. 5 oz.
Weight of common shell loaded,...	15 lbs. 7 oz.
Bursting charge, ...	9 oz. 14 drs.
Initial velocity, ...	1457 f.s.
Weight of shrapnel loaded, ...	16 lbs. 9½ oz.
Bursting charge, ...	12½ drs.
No. of balls, ...	274.
Weight of case, ...	16 lbs. 8½ oz.
No. of balls, ...	76.
Weight of carriage, ...	10 cwt. 1 qr. 9 lbs.
Track, ...	4′ 11″.
Height of axis of trunnions, ...	39·88″.
Weight of limber packed, ...	17 cwt. 3 qrs. 2 lbs.
No of rounds in limber, ...	15 common.
...	15 shrapnel.
...	1 case.

Weight behind team about 37 cwt.

For uncleanliness in turn-out and equipment I was prepared at German manœuvres, but not for such roughness and lack of finish in manufacture. There are no axle-tree boxes, but the guns are provided with axle-tree seats.

The carriage is of iron, the wheels of oak with bronze pipe boxes. There is a brake for each wheel, which can be put into gear by a small hand wheel underneath the axle-tree seat, by the man sitting thereon.

The handspike is of iron, and lies along the left bracket hinged near the trail plate. The elevating gear, which looked a rough arrangement, consists of a double screw working in a block between the brackets, turned by a hand wheel and supporting the breech of the gun.

The horses were long legged animals, leaders running about 15-1½ hands, the wheelers about 2 inches higher, and although looking in bad condition, seemed to have plenty of work in them when manœuvring over the sometimes rough and hilly, but always open ground.

The driving was very fair, but the particular form of pole equipment seemed awkward.

The pole props were invariably let down at the halt under every circumstance.

The following points struck me generally at the manœuvres in connection with these batteries :—

(1). The long time it took to bring the "Abtheilung" into action from the "preparatory position."

(2). When coming into action all ranks took off their head-dress.

(3). The layers carried field glasses slung round their necks, and laid with whichever was their better eye.

(4). Although there is practically no puff, the flash of discharge from the smokeless powder was most vivid and easy to lay on.

(5). Guns were run up after discharge (although only firing blank) for practice, and run back again after a few rounds when advanced too far to the front of the position.

(6). All ranks wore revolvers, and No. 4 a strap to which is slung a cartouche, as a cartouche of cartridges was brought up to the guns, never single cartridges.

(7). The blue paint with which the carriages are painted renders them most conspicuous.

(8). An "Abtheilung" came into action with all batteries simultaneously, but always retired by single batteries in succession from a flank, at about three minutes intervals between batteries. All retirements commenced at a walk followed by trot or gallop.

(9). Fire discipline is not equal to our own at field days.

(10). The ammunition supply from the limbers was maintained on two systems :—

(*a*). The limbers were brought up and reversed 15 yards in rear of their respective guns. The teams remained hooked in, drivers dismounted.

(*b*). Two limbers were brought up and placed close to and in rear of second guns from the flanks respectively of each battery. The teams were unhooked and with the remaining two limbers (teams hooked in) formed up in column of route about 60 yards in rear of the least exposed flank of each battery.

(11). Screens were invariably shown to indicate the target at which the batteries were firing, but an unnecessary amount of blank seemed to be consumed, commencing with ranging rounds of smokeless powder, followed by rapid fire with smoke powder. This latter was merely used as a matter of economy I was told.

(12). A single battery was frequently detached from an "Abtheilung" to take up a position on the flank of and nearer to the enemy's artillery.

(13). The wholesome "funk" that cavalry seemed to have of charging guns was most marked.

Frequent opportunities occurred, notably on one occasion when the VI. Uhlans might have got in on the flank of a battery with apparent impunity but refrained.

(14). At the "pow-wows" after the daily manœuvres all Artillery Officers "fell out" and attended the discussion.

(15). The absence of wagons made it impossible to carry out the renewal of ammunition in action, and when we remember that at the battle of St. Privat the Artillery of the German Guard fired more than 8000 rounds, necessity for practice in this is obvious.

The following table gives the principal data of the German Siege and Heavy Ordnance :—

	GUNS.					MORTARS.		
Data.	Heavy 9 cm (3·5-in).	†Heavy 12 cm (4·7-in).	*Short 15 cm (5·9-in).	Belted 15 cm (5.9-in).	Short 21 cm (8·2-in).	9 cm (3·5-in).	* 15 cm (5·9-in).	21 cm (8·2-in).
Breech mechanism,	Cylindro prismatic wedge.	Cylindro prismatic wedge.	Double wedge.	Cylindro prismatic wedge.	Screw.	Screw.	Screw	Double wedge.
Calibre,	3·464″	4·736″	5·87″	5·87″	8·16	3·464″	5·87″	8·24″
Total length,	82·7″	110·6″	84·02″	135·4″	94·4″	28·2″	32·5″	80·3″
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	qr. lb.	cwt. qr. lb.	qr. lb.
Weight of gun,	8 0 12	25 2 10	29 2 3	59 1 22	47 3 19	8 7	13 1 0	80 3
Number of grooves,	24	30	24	24	30	24	24	30
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Weight of carriage,	15 0 14	19 2 16	25 3 9	34 3 13	29 1 24	7 6	12 0 7	39 3 3
Common shell weight,	15·5 lb.	35·8 lb.	60·9 lb.	61·2 lb.	169·4 lb.	15·4 lb.	60·4 lb.	170·5 lb.
Common shell bursting charge,	10 oz.	2 lb. 6·7 oz.	4 lb. 3 oz.	4 lb. 3 oz.	9·77 lb.	9·85 oz.	4·18 lb.	8·78 lb.
Shrapnel weight,	16·6 lb.	43·2 lb.	68·3 lb.	87·1 lb.				
Shrapnel bursting charge,	·79 oz.	1·59 oz.	1·76 oz.	1·76 oz.				
Number of bullets.	274	445	462	635				
Weight of bullets,	200 grs.	200 grs.	420 grs.	420 grs.				
Service charge,	3 lbs. 5 oz.	7 lb. 11 oz.	3 lb. 5 oz.	12 lb. 12 oz.	6 lb. 9 oz.	up to 6·3 oz.	up to 1 lb 15·6 oz.	up to 7 lb. 11 oz.
Initial velocity per sec.	1457 ft.	1462 ft.	830 ft.	1414 ft.	712 ft.	452 ft.	585 ft.	699 ft.

*These two pieces are practically obsolete, having been replaced by the 15 cm steel shell gun, firing a 40 lb. projectile. This latter piece, and the 21 cm bronze mortar with steel tube throwing a 145 lb. projectile, are likely to constitute the armament of the German heavy batteries.

† This piece is now constructed with a central tube of nickel steel in order to withstand the destructive effects of the " obus a torpille " now one of its projectiles.

HINTS FOR THE GUIDANCE OF OFFICERS, AT FOREIGN STATIONS, IN THE DETECTION OF PRECIOUS STONES.

BY

MAJOR T. PRESTON BATTERSBY, O.S. DEPT. (*late* R.A.).

In these days of progress the British officer is expected to be a sort of "admirable Crichton," excelling alike in all manner of physical and mental accomplishments. Everyone who has a "hobby" or a "fad" writes to urge that the ideal officer should have a knowledge of this particular subject at all events! As for the artilleryman he is called upon to be at once a mathematician, an advanced scientist, a magistrate, a skilled tactician, a mechanic, a veterinary surgeon—in short a veritable "Jack of all Trades." If I venture to introduce one more subject of study to his notice, it is only because it possesses the novelty of being one which, besides adding to his usefulness in the very common function of explorer of new countries, may very possibly put some hard cash into his empty pocket.

In 1893 I was quartered in Barbados. As, probably, most of my readers know, Barbados, as an artillery station, is doomed. For many a month past the gunners have been toiling under the tropical sun hauling heavy guns up the steep slope of the Morne Fortunée at St. Lucia. Now that that arduous work is completed, they can, at their leisure, admire one of the finest views in the world, of sea, and island, and virgin forest—and heartily wish themselves back in Barbados! For life in an island where the study of primitive nature is the only occupation available, does not appeal much even to the gunner variety of Thomas Atkins!

The C.R.E. of the district, returning from one of his frequent visits to St. Lucia, brought back with him a paper of colourless octahedral crystals, which he had picked up one day when sitting down to rest in an unfrequented spot. He knew that the diamond crystallized in this form, and hoped that he had made a valuable discovery. I was sorry to undeceive him but, on examination, found the stones to be white spinels—hitherto, so far as I know, only found at La Riccia, near Rome, and interesting on that account, but, as an article of commerce, valueless.

But, my point is, they might just as probably have been diamonds and, for aught that anyone knows to the contrary, diamonds, rubies, or any other stones of value may be lying on the ground in St. Lucia, or elsewhere, and no one be the better for them till, some

day, a man who knows picks up one, tests it, and makes his fortune. My object in this paper is to show my brother officers, who may not have studied the subject, how very easy a matter it is to identify precious stones, with a minimum of trouble and apparatus.

Few branches of knowledge are more universally neglected—it is hard to say why, unless from preconceived notions of the difficulty of the subject, which are quite unfounded. Emanuel mentions a man who disposed of a good business, and started for England to make his fortune by selling a parcel of "diamonds," which turned out to be rock crystal! In 1889 much excitement was caused by the discovery of "rubies" at the Jasper mines in the Shan State of Momeik. The "precious stones" were sent to Calcutta, and there found to be tourmalines! It is almost incredible that either of these mistakes should have occurred; and shows the extraordinary ignorance prevailing on the subject. I hope to make such errors impossible in the future—in any place, at least, where an artillery officer is stationed—and to show him how to identify any unusual crystal or pebble which he may pick up.

For the present we may omit opaque stones. The only one of any value he is likely to find is turquoise, of which more anon.

The first thing to do on finding a transparent stone, is to try if it can be scratched with the point of a good penknife. If it can, it is certainly *not* a precious stone, whatever its value mineralogically, and may be thrown away.

If it resists the penknife, examine its colour, and compare with Table I. Colour alone will be seen to be very little guide.

If the stone is very clear, look through it at a bright point of light. If two images of the light can be seen the stone can neither be a diamond, spinel, nor garnet. The converse however would be unsafe to go upon, as it is not very easy to see the two images with some double refraction crystals.

Heat the stone and try if it will pick up minute fragments of paper or wood ashes, as a rubbed stick of sealing-wax will. If it does, the stone is probably a topaz or a tourmaline. The latter stone is called "aschentrekker" by the Dutch, from this property. When found in large crystals with different shaped ends, it is excessively pyroelectric. Even this elementary test would have saved the Burmese Government some trouble and expense in the case of their "rubies." A jargoon (zircon) acquires some electricity by heat, but not sufficient to form a good test.

(Most precious stones acquire either positive or negative electricity by friction, but this is too common a property to be of much value, except to the professional jeweller).

Take the stone into a perfectly dark room, and rub it briskly on cloth, wood or metal. If it phosphoresces it is certainly a diamond. No other stone possesses this remarkable property. Mr. G. F. Kunz says that *all* diamonds possess it, but I have not found it so.

Examine the crystallization by Table IV., if the stone is a crystal.

We cannot go much further without apparatus, but this may be of the simplest. Much may be done with a crystal of sapphire, and a

crystal of quartz, which any jeweller—Mr. Streeter of Bond Street for choice—would supply for a nominal sum—say 1s. Every officer proceeding abroad, who wishes to search for precious stones, should provide himself with—at least—this most light and inexpensive outfit, and have a little box made to hold the crystals.

With these alone we can do a great deal. Refer to Table II. and study the comparative hardness of stones. A stone of hardness 5 can just be scratched with a good penknife.

The unknown stone can first be tested by trying if it will scratch glass—a sharp point of the stone being chosen for the purpose. It is a good thing to carry a bit of hard flint glass for this experiment.

If it does not scratch glass and cannot be scratched with a penknife, it is probably apophyllite, and more of a curiosity than a gem stone. If it scratches glass *feebly* it might be epidote, moonstone, axinite, sphene, etc. None of these stones are of much value, except the Bobrowska garnet, which is very unlikely to turn up anywhere that the artillery officer may be quartered, and the precious opal, which is unmistakable and needs no test at all.

If the stone scratches glass and is scratched by quartz, it is possibly peridot or chrysolite. Observe the colour. Good stones of peridot would fetch a good price at present.

Now take your crystal of sapphire and try its point on your stone. If it does not scratch it and is scratched by it, the stone is a diamond beyond all doubt. If it does not scratch it, and is not scratched by it, it is a form of corundum.

The corundum gems are, according to colour, sapphire, ruby, white sapphire, oriental topaz, oriental emerald (very rare), oriental amethyst.

Of these the white sapphire is of little value. So is the oriental topaz, simply because the public distinguish not between this fine stone, the Brazilian topaz, and yellow rock crystal. The same may be said of the oriental amethyst, though a fine specimen might be perhaps sold. The oriental emerald is very rare, and would fetch a high price. The value of the sapphire and ruby depends chiefly on their shade of colour. That of the costliest sapphires is the blue of the corncockle flower, that of the ruby the red of a drop of pigeon's blood on white paper. But where one corundum crystal is found, others may be; and the colouring is simply a matter of homœopathic quantities of material which defy analysis by their minuteness. So the searcher need not be discouraged if his crystal is white, yellow or violet.

This is about as much as an officer can do with his two testing crystals, but it is already a good deal to accomplish with tools costing about a shilling, and weighing, say, half an ounce. He is now in a position to identify the diamond, ruby and sapphire. Surely everyone ordered abroad might well take with him so portable and inexpensive an apparatus, and spend a few idle hours in searching unfrequented spots, pebble beaches and such like, with the chance of a great reward! If all R.A. officers did so, I am pretty sure that some fortunes would be made, and that a large addition to our mineralogical knowledge—if not to the wealth of England—would accrue.

It will be observed that sapphire is just a trifle harder than the

other corundum gems. But this will not be appreciable to the experimenter, who will scarely succeed in scratching a ruby with a sapphire, under any conditions.

If the searcher cares for a more elaborate outfit for testing hardness, I have no doubt that Mr. Streeter would willingly make him up a case containing pieces of diamond, sapphire, topaz, quartz, felspar, and apatite. A reference to the table will show how these might be used. Each would scratch all stones below it—more or less easily, as they are placed in the table. Thus felspar would barely scratch opal, but would scratch sphene pretty readily. The reader will see that by locating his stone between two of his test pieces—say "scratched by topaz—scratches quartz" he will have narrowed its possible identity within very small limits, and will probably be able to name it from its colour or crystallization (Table IV.). If he still cannot do this he had best resort to specific gravity (Table III.).

Specific gravity is very easy to find—theoretically. You weigh your stone in air, then in distilled water, and say—

Weight of stone in air ÷ (weight of stone in air − weight of stone in water) = specific gravity of stone. Nothing is simpler, if your stone weighs a few ounces and you have a good spring balance. But if, as is generally the case, it weighs a *very* few grains—then you cannot get on, without an apparatus that would cost several pounds, and be too delicate and bulky to carry about. So you resort to heavy liquids.

I give a list of several of these, but not full details, as I can only recommend the last for reasons given :—

"Sonstadt's Solution."

Solution of iodide of mercury in iodide of potash. Exceedingly poisonous and corrosive; dangerous to have in a house. Stones must be inserted with *steel* pincers. In hot climates a specific gravity of 3·17 is obtainable, but not in England, so far as my experiments go.

"Rohrbach's Solution."

Solution of iodide of mercury in iodide of barium. Very poisonous. Decomposes on addition of water, so troublesome to vary. Highest specific gravity obtainable = 3·588.

"Braun's Methylene Iodide."

Has to be diluted with benzole, not water, and kept in the dark, with a globule or two of mercury in it. Price about 4s. the ounce. Highest specific gravity obtainable = 3·33.

"Methylene Iodide, with Iodoform and Iodine."

Unstable and messy. Highest specific gravity obtainable = 3·65.

"Iodide of Silver and Nitrate of Silver."

Liquid at 70° centigrade. Specific gravity = 5. Too great for our use.

"Chloride of Zinc and Chloride of Lead."

By melting these together, and varying the ingredients, liquids of

all densities from 3 to 5 can be obtained, and as the salts are soluble in water the stones can be easily cleaned. This is not a bad mixture, and very cheap, so might be used on an emergency. But I very strongly recommend that which follows, as it is "facile princeps" in ordinary work.

"KLEIN'S BOROTUNGSTATE OF CADMIUM."

This substance is a solid of the chemical composition (according to Professor Church).

$$9\ WO_3\ B_2O_3,\ 2\ Cd\ O,\ 2\ H_2O + 16\ Aq.$$

If gradually heated (in a water bath, easily constructed anywhere) the crystals dissolve in their own water of crystallization, and form a liquid having, at about 170° Fahrenheit, a density of 3·55.

In this liquid all the stones in Table III. above topaz will undoubtedly sink, and all below diamond float. Diamond and topaz will probably sink, but will be so near the density of the liquid as to afford the experimenter a pretty good clue to their specific gravity.

This experiment will very greatly clear the list for most stones. But borotungstate of cadmium is capable of easy solution in water, and of being recondensed by heat. Dissolved in about $\frac{1}{10}$ of its weight of water it yields a solution of density about 3·28. It can be tested by trying if it will just float a piece of hornblende. A stone floating in the 3·55 solution, and sinking in the 3·28 must be sphene, peridot, epidote, diopside or axinite. The odds are greatly in favour of its being peridot. It is clear that if we carry about with us a set of crystals of known specific gravity we can narrow our limits to any extent. Dissolve the borotungstate in, say, its weight of water, throw your stone in, and condense by gentle heat till the solution is dense enough to bring the stone to the surface. Then try the density with your test crystals, and you will get a very close approximation to the specific gravity of your stone. If you cannot float it by concentrating the solution, try the above mentioned 3·55 solution. If it sinks in that, it is one of the stones above diamond in Table III., and you can carry the test further with chlorides of zinc and lead in a molten state. But it is not really necessary, as the hardness of the stone, and its form of crystallization—if found in crystals—will almost certainly identify it.

Mr. Streeter would doubtless put up a set of test crystals of known specific gravity, or the officer could readily mark off a set for himself with the aid of a Nicholson's hydrometer (*vide* Ganot's Physics). This instrument would be of little use to take abroad, as its indications depend on so many corrections (temperature of water, etc.). The great advantage of the heavy liquid capable of variation of density is that it is independent of all corrections.

I do not know whether the borotungstate of cadmium is obtainable in London—most likely it is. It is sold by Marquart, of Bonn, at a price of about £2 the kilogramme. It can of course be recrystallized, and used over and over again, and a very small quantity is needed for an experiment on such small stones as we are likely to find.

If a stone is found in definite crystals, consult Table IV. Any

treatise on mineralogy will show the different forms of crystals belonging to each system, and it is sometimes a valuable guide. Thus the stones picked up at St. Lucia by the C.R.E. were exceedingly perfect octahedra, of form of two four sided pyramids joined at the base. This at once showed that they were either diamonds, spinels, or garnets. They were scratched by sapphire, and scratched a garnet, therefore were white spinels. No further test was required.

The experimenter is now in a position to identify any stone he may come across. I would recommend him to add to his tools a little hand-book, which weighs about 4 ounces, and contains a vast amount of interesting information on the composition, appearance, colour, etc. of all the stones used in jewellery.

"Precious Stones, by A. H. Church, M.A., etc."

It is a "South Kensington Art Hand-book," published by Chapman and Hall. I think the price is about 1s. 6d.

With this to aid him, and the above mentioned apparatus, anyone with the least brains in his head would find that he could identify any transparent stone. He should especially search for the following, from a commercial point of view:—

"Diamond, ruby, sapphire, chrysoberyl cat's eye, precious opal, emerald."

But really fine, flawless, large crystals of almost any stone but the topaz and the quartz gems would be worth securing.

No white stone but the diamond is of much value, as the public look upon all such in the light of "would be diamonds if they could." The general public appear to be of opinion that any colourless stone mounted in jewellery is a diamond or an imitation, any red stone a ruby or a garnet, any yellow a topaz, any green an emerald, any blue a sapphire. An oriental topaz is no more like a yellow quartz "topaz" than a diamond is like rock crystal, but it is all the same to the public.

There is one other instrument which is useful—though not at all essential—to the gem seeker. This is the dichroiscope. It is rather smaller than an Abney's level. When a coloured crystal is double refracting—as all are except diamond, spinel, and garnet—it shows two colours, at least, when viewed with the dichroiscope. Table V. is extracted from "Church's Hand-book" aforesaid, and contains a list of some of the colours thus shown. Certain stones such as axinite, iolite and tourmaline are dichroic to the naked eye, the crystal showing different colours according to the direction in which it is examined.

I will conclude by saying a word as to the buying of cut precious stones. If a man understands them he may pick up amazing bargains. A pawnbroker's shop will often furnish old rings and brooches set with valuable stones, and sold for little more than metal value. I have bought a chrysoberyl cat's eye in a rude Indian mounting for 15s., and there is a queer old shop on the Dublin Quays where a queer old jeweller lives, who has cupboards full of stones and pastes and sells them at most reasonable rates. I think he has a large clientèle; when I was last there, some five years ago, he showed me a fine opal

which he was sending out to an officer in Egypt, who wished to make a present to the late Khedive.

It ought to be generally known—but it is not—that in cool climates like that of England, it is quite impossible to mistake pastes for stones. You have only to touch them with the tip of your tongue. All stones are first-rate conductors of heat and feel intensely cold to the tongue (as a rule the denser they are the colder they feel) ; paste (a glass of great brilliancy, with a lot of lead in it, coloured to represent different gems) is a poor conductor, and warm compared with stones. A single experiment will be quite sufficient to enable anyone to tell a stone for ever after. I always keep some pastes by me, with my collection of precious stones, in order to illustrate this fact to visitors. They generally go home and "lick" their jewels ; and occasionally find, like Solomon, that "he that increaseth knowledge increaseth sorrow!"

The more lead you put into glass the brighter will the latter be, and the softer it will become. You can almost dig the point of a penknife into a really brilliant paste. I got a parcel of topazes from a Leeds firm once, and amongst them was the most brilliant gem I ever saw. It was nearly, if not quite, equal to a yellow diamond in refractive power. Alas! it was as soft as fluor-spar, and warm to the tongue. I tried for days to persuade myself that it might be real, but as I found its specific gravity over 4 and therefore it could—if a stone —be only an oriental topaz of hardness 9! I finally sent it back. The dealer insisted it was genuine, and wrote that he had sold it to a customer for 12s. 6d. I have no doubt he did, and that it was worth more in the market than any real topaz—of which you can now buy good cut crystals for a shilling or two!

You cannot mistake a cut garnet for a ruby. Looked at with the light behind you, the garnet always has a blackness that is quite absent in the ruby. Try the experiment. Some spinels are more like rubies. Spinels are much used in cheap rings.

If anyone has a yellowish "off colour" diamond, which he wishes to improve for his own personal use, he can easily do so by a process invented by a Frenchman several years ago. The inventor came over to England with a lot of "improved" diamonds, and did a truly glorious trade. He sold some £5000 worth before the jewellers discovered the dodge. I think it was discovered in the end by the accident of a stone falling into some alcohol. Now-a-days no diamond buyer would purchase a stone without trying the effect of spirits of wine upon it, so that it can do no harm to disclose the secret.

Take a blue aniline copying ink pencil and scrape off with a penknife a shaving or two. Moisten with water, which will make a fine blue solution, with which paint the back of your stone delicately with a camel's hair brush. You need not put on more than an invisible layer of colour. When it dries it should be so thin as to be quite imperceptible to the naked eye. The stone will now have lost all trace of yellowness, and look like a gem of the first water. It is a most curious experiment. Dipping in alcohol removes the colouring matter at once.

The worth of really noble gems depends so much on infinitesimal

shades of colour, etc. that none but a professional can really value them. I have been studying gems for several years, and I would not dream of purchasing a large diamond, sapphire, or ruby, at anything like the market price for such stones, on my own judgment. The curious thing is that the jewellers themselves know, as a rule, very little indeed of most stones. I got a pink pearl in Barbados 67 grains in weight, and rose pink in colour, and I got a different opinion upon it from almost every jeweller to whom I showed it in London. Perfect flawless stones have a pretty definite value in the market; but they are infinitely few, and the moment the colour falls off, or a flaw, however minute, appears, it becomes seemingly entirely a matter of opinion how much this detracts from the value of the gem. Should any of my readers be fortunate enough to make a discovery of precious stones, I can only advise him to throw himself upon the mercy of Mr. Streeter, Watherston & Co., or some other first-class jeweller, and take what he is offered, which might be about half what the cut and mounted stone will fetch.

I have not referred to opaque stones in this paper, as they are none of them of much value as gems, and are perfectly easy to distinguish by eye. The turquoise is an exception. The stones which might be taken for it are odontolite, callainite, and chrysocolla or silicate of copper. Odontolite is fossil ivory stained by phosphate of iron or copper. It is of some value. Softer than true turquoise, and emits an odour when heated. Callainite is so soft as to be scratched with a penknife. Chrysocolla is also soft and has a specific gravity of only about 2·2.

The most hopeful geological formations in which to search for precious stones are the primary, non-fossiliferous rocks, and their derivatives, but they may occur almost anywhere. Where diamonds are found gold is generally present for some unknown reason. The only diamond ever found in Europe was picked up by an Irish peasant girl, amongst the pebbles of a little stream at Maguire's Bridge, Fermanagh, Ireland! It is supposed to have got there in the crop of some migratory bird. Fowls are very fond of swallowing bright stones, and their gizzards and crops might be examined in a new place. Pebble beds near mouths of rivers are perhaps the best hunting grounds of all.

Precious opal can be distinguished at a glance. Very often a stone of this kind which has lost its brilliancy can be improved by hanging it up near a water tap (not, of course, *under* it), and leaving the tap running for 24 hours or so.

If any reader of this short paper should become really interested in the subject, I would recommend him to purchase the following books —in addition, of course, to Professor Church's Little Hand-book.

"Diamonds and Precious Stones, by H. Emanuel."

Publishers "Chatto and Windus," price 6s. This is an excellent practical treatise, and contains valuable tables and illustrations of the crystalline forms of many gems. As regards *prices*, it is somewhat out of date, but otherwise one of the best works I know on the subject.

"'Precious Stones and Gems,' by E. W. Streeter."

Publishers "George Bell & Sons, Covent Garden," price 15s. A standard work on the subject, with coloured illustrations of many stones in their rough condition. Mr. Streeter is a well known expert and generally summoned as such in law cases. I think however that Emanuel gives more value for 6s. than Streeter for 15s. Both books should be purchased by anyone who intends really studying the subject.

When these have been perused, and the reader requires more, he will find much learned gossip upon jewels of all kinds in the most interesting works of the Rev. C. W. King, M.A., of Cambridge. They are published in Bohn's 6s. series, and are entitled—

"Precious Stones and Metals." "Gems, or Semi-precious Stones."

They are beautifully written works, of great value to anyone who cares for the romantic side of the subject, or for its connection with antiquity. Here and there they give hints as to localities whence the Romans drew their gems, and which would repay search in the present day. It is worth studying the author's remarks on the emerald mines of Egypt, now that we are in occupation of that country. But the reader must consult the books for himself, as I have already exceeded the limits I had proposed for my paper.

TABLE I.

Colours of Precious Stones when Transparent.

WHITE.

Apophyllite; beryl; diamond; garnet; moonstone; *phenakite;* quartz (rock crystal); sapphire; *sphene;* spinel; topaz; tourmaline; zircon (jargoon).

BLUE.

Anatase; Beryl; diamond; *euclase; iolite;* sapphire; spinel; topaz; tourmaline.

RED.

Apophyllite; chrysoberyl; diamond; garnet; ruby; spinel; tourmaline; zircon (jacinth).

YELLOW.

Beryl; chrysoberyl; diamond; *euclase;* garnet (cinnamon stone); oriental topaz; *phenakite;* quartz; *sphene;* spodumene; topaz; tourmaline; zircon (jargoon).

ORANGE.

Diamond; garnet; quartz; spinel; topaz; tourmaline; zircon (jacinth).

GREEN.

Beryl; chrysoberyl; diamond; *diopside;* emerald; epidote; *euclase;* garnet

(uwarowite and bobrowska); hiddenite; oriental emerald; peridot; spinel; topaz; tourmaline; zircon (jargoon).

VIOLET.

Axinite; garnet; quartz (amethyst); oriental amethyst.

Note.—The stones in italic are very rare, and little used in jewellery.

TABLE II.

Comparative Hardness of Precious Stones.

Diamond	10	
Sapphire	9	
Other corundums...	8·9	(Ruby, oriental emerald, oriental topaz, oriental amethyst).
Chrysoberyl	8·5	(Of great value if "chatoyant," or showing a "cat's eye").
Spinel	8	
Topaz	8	
Phenakite	8 to 7·5	
Beryl and emerald	8 to 7·5 ...	(Beryl generally hardest).
Zircon	7·8	(Jacinth and jargoon).
Uwarowite, garnet	7·8	(May reach 8).
Garnet	7·5	(Almandine, pyrope, &c).
Euclase...	7·5	
Iolite	7·3	
Essonite, garnet ...	7·2	(Cinnamon stone).
Quartz	7	(Rock crystal, amethyst, &c.).
Spodumene	7	
Hiddenite	7	
Peridot	6·75 to 6·5	
Jade	6·5	
Epidote...	6·5	
Moonstone	6·3	
Axinite	6	
Bobrowska garnet	6	
Turquoise	6	
Felspar...	6	
Diopside	6	
Opal	6 to 5·75	
Anatase	5·8	
Sphene	5·5	
Lapis lazuli	5·2	
Apatite	5	
Apophyllite	5	
Callainite	4	(Often taken for turquoise. Penknife scratches it easily).

TABLE III.

Specific Gravity of Precious Stones.

Anatase	4·86	
Zircon—jacinth ...	4·8 to 4·6	
" —jargoon ...	4·7 to 4 ...	(Only orange and dull green varieties are below 4·6).
Garnet—almandine	4·3 to 4	
Corundum gems ...	4·2 to 4 ...	(Ruby; sapphire; oriental topaz, emerald, and amethyst).
Bobrowska garnet	3·85	
Chrysoberyl cat's eye	3·8	
Garnet—pyrope ...	3·8 to 3·7	
Chrysoberyl	3·7	
Spinels	3·7 to 3·6	
Essonite garnet ...	3·6	(Cinnamon stone).
Topaz	3·6 to 3·5	
Diamond	3·6 to 3·5	(Average 3·52).
Sphene	3·5	
Peridot / Chrysolite	3·4 to 3·3	
Epidote	3·4 to 3·3	
Diopside	3·3	
Axinite	3·29	
Spodumene	3·2	
Tourmaline	3·1	
Euclase	3·1	
Phenakite	3	
Hiddenite	3	
Turquoise	2·8	
Emerald / Beryl	2·75 to 2·7	
Quartz	2·65	
Iolite	2·6	
Moonstone	2·58	
Apophyllite	2·3	
Opal	2·3 to 2	

TABLE IV.

Systems in which Precious Stones Crystallize.

Cubic or Monometric System.

	Commonest form of crystal.
Diamond.	Octahedra, rhombic dodecahedra. *Faces often curved.*
Garnet.	Rhombic dodecahedra.
Spinel.	Octahedra.

Pyramidal, Dimetric, or Tetragonal System.

Jacinth.	Square prisms, ending in square pyramids.
Jargoon.	do do do do do do
Epidote.	Long oblique prisms.
Apophyllite.	
Anatase.	

Rhombohedral, or Hexagonal System.

Corundum gems.	Hexagonal single and double pyramids.
Emerald and Beryl.	Hexagonal prisms.
Tourmaline.	Hexagonal prisms.
Quartz.	Hexagonal prisms.
Phenakite.	Hexagonal prisms.

Prismatic, Trimetric, or Orthorhombic System.

Chrysoberyl.	Flat hexagonal crystals.
Topaz.	Right rhombic prisms.
Peridot.	Very rare in crystals.
Iolite.	

Oblique, or Monoclinic System.

Euclase.	
Spodumene.	
Hiddenite.	
Moonstone.	
Sphene.	Wedge shaped pieces.

"Triclinic or Anathic" System.

Axinite.

TABLE V.

COLOURS SHOWED BY DICHROISCOPE.

Sapphire (blue).	Greenish straw.	Blue.
Ruby (red).	Arrora red.	Carmine red.
Tourmaline (red).	Salmon.	Rose Pink.
do (brownish red).	Umber brown.	Columbine red.
do (brown).	Orange brown.	Greenish yellow.
do (green).	Pistachio green.	Bluish green.
do (blue).	Greenish grey.	Indigo blue.
Emerald (green).	Yellowish green.	Bluish green.
Topaz (sherry).	Straw yellow.	Rose pink.
do (pink).	Dull white.	Rose pink.
Peridot (pistachio).	Brown yellow.	Sea green.
Beryl (sea green).	Straw white.	Grey blue.
do (pale blue).	Sea green.	Azure.
Chrysoberyl (yellow).	Golden brown.	Greenish yellow.
Iolite (lavender).	Pale buff.	Indigo blue.
Amethyst (purple).	Reddish purple.	Bluish purple.
Epidite (green).	Emerald green.	Yellow.
Phenakite (yellow).	White.	Yellow or brown.

INDIAN TROOP HORSES IN STABLES AND ON THE LINE OF MARCH.

BY

MAJOR E. C. HAWKSHAW, R.A.

Preface.

In offering these few lines to my brother officers, I am well aware of the already acquired knowledge of them by the majority, but on the principle of "pacing a troop by the slowest horse" I have ventured to put them on paper in hopes that the hints herein contained may be of some use to somebody.

As the management of troop horses in India so much varies with the time of year, if you want to keep them fit, I have taken the year in periods beginning with April.

APRIL.

Inspections being now all over, and the hot weather and consequent leave season beginning, most Commanding Officers wish to keep things up to the mark without the hard wear and tear of the cold weather with its marches, camps of exercise and practise. With this end in view a horse's constitution undergoes no harm by a change too in the matter of food. The grass fund is an admirable institution to harbour your strength with. By cutting your horses' food a little during the summer and putting the proceeds into the grass fund you are in a position to feed them with more than the regulation allowance when your hard work comes in the cold weather, and they consequently require it more.

The mistake, however, is too frequently made of cutting the animals' food and bucketing them about as well. This, of course, is fatal.

Too high feeding in hot weather leads to skin disease unless there is a great deal of sweating to counteract it, and the result of the sweating, when the ground is so very hard, is that the horses are lamed to no purpose through various causes. A small amount of perspiration is good for man and beast, and the latter on 8 lbs. of half gram and half bran, if properly administered and exercised with discretion, will be fit and well.

All the horses in my battery get a seer before they go out in the morning during the hot weather, and their regular feed in the winter. They never leave the lines on an empty stomach.

Grass is as a rule easily procured now. Look forward, therefore, to the rains, when you will badly want dry grass and bedding, and make

a good stack of each, containing enough to take you through July, August, and September.

The dry grass you are now forced to keep the horses going on is much improved by being mixed with lucerne or guinea-grass. Carrots, too, at any time when procurable, clear a horse's blood.

Our great enemies during the hot weather are (1) flies; (2) skin disease; (3) lameness; and (4) colic.

(1) Flies.

As regards (1) prevention is better than cure, so keep all tails uncut from the minute that your last cold weather inspection is done. This will, however, be useless for a horse's chest, which we frequently see bitten, and with large lumps between the front legs from his hitting himself there with his hind feet in order to knock the flies off.

A simple remedy for this is to get two old "puggris" or a piece of thin cloth about 28 inches wide. Fasten one end to the jowl piece of the head-collar, the other passing between the legs to a roller. Let it be tolerably loose. A horse soon finds out that if a fly gets between his legs and he throws his nose up the fly is knocked off. Thin cotton jhools are good but require constant repairing. Lime spread on the floors of the stalls is an efficient preventive.

(2) Skin Disease.

I know of no better remedy than, directly you see the nuisance appearing give the horse a dose of salts, stop his gram, give him oats instead, or bran only if not requiring hard work from him, and let him do all the work you possibly can without his falling away. Touch the sores with acetic acid, and have him washed with soft soap and water once a week, rubbing the soap well into the skin.

(3) Lameness.

Is too large a subject to enter into thoroughly here. I can only add to what I said before, that a horse's foot was not made to be incessantly banged on to ground as hard as a macadamized road with the additional weight of a heavy iron shoe attached to it. Flies are at the bottom of half the lameness from kicks.

(4) Colic.

An excellent preventive for colic is to put some nice clean clay mud into the water before the horses are allowed to drink, and stir well. The cases where horses, hitherto subject to it, never had it after this simple procedure, are legion.

The usual cause of it is dirty grass or watering horses when they are hot, on coming in after the morning parade.

A little thought so easily avoids this. If the parade is with the guns, or riding drill, nothing is simpler than to do all the trotting and galloping during the early period of the parade, leaving the remainder of the time for slow movements, during which time the horses all get cool. There are, however, always some which perspire more freely than others; these, a good horse-master will only permit to have

about two swallows of water on return, and give them their long drink when they have had time to get cool.

JULY, AUGUST, SEPTEMBER.

We are now in the rains and combating with the evils of (1) wet bedding and grass; (2) nothing but the roads to exercise on; (3) bad feet.

(1) Wet Bedding and Grass.

To treat these the following will be found a good plan. Take your one day's supply of grass and spread it all out under cover (some place can always be found), turning it over three or four times in the twenty-four hours. Grass, however wet, will dry very much in this way. You can then mix about one-third of this next morning with two-thirds of your dry store that I previously advocated, and your horses will have a good wholesome ration. Then put the remaining two-thirds of this wet grass with your dry store, shake it up, and one will dry the other, and so on. In this way your horses will not go wrong, and will keep in serviceable condition throughout the autumn.

The serviceable mounted corps is the one whose horses are always fit for work, and not, as I have seen before this, unfit to be on parade in the autumn, and then filled with grass and polished up for the inspections of the year. A sound critical eye, however, sees through this. The slimy condition thus produced does not deceive him.

(2) Exercise on the Roads.

I put this in because now that so many horses are shod only on the fore feet, the hind feet, though right enough so long as the ground is soft and dry, want constant watching when the animal is confined in wet weather to a hard stony road. The damp softens the hoof and causes it to wear down until the feet are so tender that the horse is lame. Some hoofs wear much quicker than others; but as soon as any hind hoofs are detected wearing down too much I advocate a racing plate being tacked on with three or four light nails at once. In this way the hoof is preserved, and the plate can be taken off when the dry weather comes on again. If the hoof is worn too much to allow of any plate being put on, the animal must be put to stand in mud until the horn grows again. The grossest carelessness, however, would alone allow the hoofs to reach this stage.

Gun and waggon horses require shoeing all round always, since their action in pulling tends to act on the toes and wear them away.

(3) Bad Feet.

The rains find this defect out terribly. Thrush, bad frogs, soft wall to the hoof, all require constant watching and prompt attention. Nature has given some horses harder hoofs than others; indeed all draught animals and beasts of burden have been provided with feet suitable to their original country.

A Welsh hill pony has a hoof like iron, so has a mule. No macadamized road makes any impression on them, because the rocks are their natural country.

Where, therefore, man has taken the animal out of its own sphere he must make up for its defects by artificial means.

Changing from a dry country to a wet one will not be unattended naturally by disease. Many bad feet are caused by too free use of the rasp over the outside of the hoof after shoeing. Like the human nail a horse's hoof has a coat of enamel over it which nature put there to confine the moisture. If therefore, this is removed, it stands to reason that the moisture escapes, the hoofs become brittle and chip away.

A remedy for this is a mild blister over the coronet to stimulate the growth of the horn, well grease the hoofs daily, and learn wisdom by your mistake in touching the outside of the hoof with the rasp at all, except just to flatten the clamps of the nails.

OCTOBER.

The rains have pretty well ceased now, the air is cooling, and the winter's work coming on. The drill ground is open, and the Commanding Officer's "innings" at his command begins.

The feeds of the horses may now go back to the regulation 10 lbs., divided into proportions of 7 lbs. gram and 3 lbs. bran. It is customary sometimes to give more of the former, but I have found it a mistake with the majority of horses. Gram has many heating qualities in it, and a too free use of it puts a horse's liver wrong. If you *do* want to give him much corn let him have oats, with bran and a few hands-full of gram in each feed. Don't work too fast at first. They have not had it for some months, remember, and require hardening gradually. Tails may now be cut, but as regards CLIPPING, there is much to be said. Anyhow, don't do it until November. The coats are then set, and postponing it until this will save you a lot of trouble.

Clipped horses look smart and are easier to clean, hence the universal desire on the part of every driver to get his pair done. Pages could be filled with the reasons put forward on occasions for this end. Clipping at all depends, or ought to do so, on what they are going to do. To clip a horse all over and then ask him to stand out at practice camps where the cold is intense with insufficient clothing is very hard usage to the poor beast. Under such conditions clipping trace-high, with the hair left on the legs, would be far more merciful and serviceable and if neatly done, looks equally smart.

Your animals now, with the treatment that has been put forward, will have in a fortnight's time of steady drill, a good solid body of sound material in them, viz., muscles and reliable flesh—and you may work away without fear.

FEEDING.

Always give your horses something before they leave the lines in the morning. The amount must depend upon the work they are going to do. If a field-day is in prospect, increase the feed, and never go without some more in the nose-bags. Much, however, must depend upon the time you leave barracks. The "Gram Orderly" system is not a sound one, and is open to many objections. In the first place a sergeant must cease in many ways to take interest in horses that are fed for him.

In my battery each sergeant has two barrels, one for gram and one for bran. He receives from the line orderly of the day the proper amount due for his sub-division. This works far better, as, in addition, it enables a Commanding Officer to cut a coarse feeder's rations, and give it to a horse that is not a "good doer." Like other animals one horse will thrive on less than another, and attention should be paid to it.

Watering.

If you want to keep a horse contented and fit, never let him be unable to get at water. He likes to dabble his lips in it when there is nothing else to do. By all means let him do so day and night. Only for reasons before stated on coming in hot stint him until he is cool.

Marching.

Few things do a horse more good, if properly taken care of, than a march in any country with the regular work and feeding every day, so long as he gets his proper night's rest. The hour of starting in the morning must depend on the time of year and the consequent heat. It used to be a hard and fast rule with some corps to turn out at unearthly hours on bitterly cold mornings. The reason is one I fail to fathom, and seems open to many objections. In the first place you cannot see to harness or feed and everybody and horse is a picture of misery—whereas a start at, say, eight o'clock, gives everybody time to get breakfast, the horses time for a feed, the cooks time to get on to the next camp with the dinners, and the whole wheel revolves smoothly. I am, of course, taking a time of year when the sun from eight to eleven is not too strong for marching in. You finish the march by about 10.45, turn into stables, and out in time for dinners at the ordinary dinner hour.

The pace is an open question. Some Commanding Officers never trot, others go at that pace every yard they can. Individually, directly on quitting the camp I trot two miles and walk one, and carry this on through the march, always walking the last two miles to bring the horses in cool. A halt for fifteen minutes every six miles. Incessant walking makes the horses and men drowsy, and is the cause of much stumbling, and also galls which are much increased by this mode of procedure.

Everything, of course, depends on the temperature, state of the roads and horses. I have ventured to put forward the above method of progression under the conditions of cool days, good roads and fit horses.

Galls.

A horse in soft condition galls much more easily than when he is fit. Extra care is therefore necessary under the former circumstances which may, however, be much avoided by regular and longer work before starting on the march.

Throwing a horse out of work altogether for a gall is a thing that is seldom or never necessary in the R.A.

I always think that horses are never called upon sufficiently in the

R.A. to do any work required of them. The general rule is that a wheel-horse is posted as such, and there he remains for his service; the same for lead, centre and detachment horses. The consequence of this is that a centre or lead horse put into the wheel in four cases out of five won't go. This is not as it should be. A horse ought to be trained to go everywhere on a pinch; and by this means galled horses are relieved temporarily, to say nothing of getting a gun along with a disabled team in actual action. Take a wheel-horse with a breeching gall, put him in the lead or centre and he can do his work.

A near-horse in a team with bad back can be changed with the hand-horse, the saddle removed and a single strap placed so as to avoid the sore over the back, for the support of the traces.

Collar galls are more difficult sometimes to deal with and avoid if you still want to keep the horse in draught. The position of the wound will sometimes allow breast harness to be used, and at others a pad is useful. A ready method of making a pad is this—and I have found it superior to any leather one, though it may not look so neat. Take a horse-rubber and roll it up with some grass, which you can pick by the road side, inside it. Fasten it on with some string or a thong from the collar-maker. It is far softer than a leather pad, and equally, if not more efficient.

For a horse that brushes, in spite of his shoes being altered, make a boot as follows: take a piece of horse-cloth or stout flannel eleven inches wide, fourteen inches long; sew a piece of tape lengthways two inches over the half breadth of it; make a hole about five inches from one end so as to allow the one end of the tape to pass through it; and tighten the whole round the leg above the fetlock, narrow part downwards; having secured the ends of the tape, turn the top over so as to cover the bottom. This will guard the fetlock well. A leather boot frequently works round.

Remounts.

When remounts arrive, having, as is mostly the case, only been a few months in the country, care is requisite not to feed too highly with gram at first. They have never been accustomed to it; much unhealthiness therefore will ensue if this precaution is neglected.

Three lbs. of gram, seven lbs. of bran, with some green food with their grass, is plenty to begin their troop discipline with. The dealers in Calcutta feed almost entirely with bran, oats (mostly crushed) and little or no gram.

Conclusion.

Before ending may I be allowed to add that the above hints are prepared for Australian horses, such as are used so much in batteries and regiments in India at present. An Arab is a hardier animal, and much in request for service on this account.

DIARY

OF

LIEUTENANT W. SWABEY, R.H.A., IN THE PENINSULA.

EDITED BY

COLONEL F. A. WHINYATES, *late* R.H.A.

(*Continued from p. 604, No. 12, Vol. XXII.*).

PART III.

Chapter IV.

Battle of Vitoria. In the pursuit the French lose their last guns. Movement against General Clausel. Siege of St. Sebastian. Promotions for the battle of Vitoria. Arrest and release of Captain Norman Ramsay. Battles in the Pyrenees. Conclusion.

19th June, 1813.—The infantry still took the lead, dislodging the enemy from the enclosed and intersected country, which is here so favourable to a retreating army. Our brigade marched late in the evening, and when we overtook the columns in our front we found them engaged and the enemy retiring before them; no great execution was done on either side. It was a terribly wet and disagreeable day, we halted for the night, encamping in a ploughed field at Subijana, crossing the river Bayas. Towards night about 600 prisoners were sent in, increasing the enemy's loss to nearly 2000 men up to this date.

20th June.—The enemy having concentrated his whole force within a league of our posts and taken up a position there, we halted to assemble ours, Lord Wellington being determined to attack, let the circumstances be what they might. For my own part I was of opinion that there would be no general action, though I was quite certain that it would take place very shortly, if at all. I took the opportunity of a halt to write to England.

21st June.—On the army being put in motion we found the enemy had taken up a position about two leagues or six miles in front of Vitoria. I must own the sight of his lines surprised me, as I had not anticipated his fighting this morning. The leading divisions were halted till Lord Wellington's arrival. On his reconnoitring the French position, it was soon seen that their left was strongly posted on a long

range of heights extending from where we were halted to Vitoria. Their centre, for the defence of which were placed nearly 100 pieces of artillery, was resting on a rather retired village on commanding ground on the high road to Vitoria. Their right was placed on a strong hill which overlooked two of the bridges across the Zadorra, a river which ran in front of their line, neither of these two bridges were strongly occupied, but both were completely raked by heavy field artillery. There were two other bridges, one further towards, and the other somewhat in rear of their right flank, upon which guns in position could not bear, but the one furthest to the right was strongly occupied by infantry and cavalry. There was likewise a great way towards the French left and in their front a bridge over which General Hill with the 2nd division and some Spanish troops was sent to make a false attack on that part of their position.[1]

Lord Wellington expected Sir Thomas Graham with the 1st and 5th divisions to make his appearance and act against the enemy's right and to completely cut off his retreat.[2] Finding he did not appear, Lord Wellington ordered General Hill to make his false attack a real one, and Sir Thomas Picton with the 3rd division to force the passage of the bridge on the enemy's right, and thus turn that flank. At the same time the light division was to cross at the second bridge on the right and attack the front.[3] As soon as the 3rd division had crossed, Major Gardiner's troop of Horse Artillery (which had left the cavalry because that arm on account of the unevenness of the ground could not act) was to pass at one of the centre bridges commanded by the enemy's artillery and support the light division. The 7th division followed the 3rd, the 6th was not up. The 4th division under Sir Lowry Cole was to force the bridge on the great Vitoria road which was completely commanded by a numerous artillery. On Sir Thomas Picton's forcing his bridge the right gave way and all advanced; the enemy's centre and left still however made an obstinate resistance, and having every advantage of ground their artillery did great execution. Nothing however could stop our troops who advanced up the hills, which continued to favour the enemy, till very near Vitoria, and though they fell back it certainly could not be called a route.

Arriving at Vitoria, they would have taken the Bayonne road, but Sir Thomas Graham had now made his appearance there, and they were compelled therefore to retire on Pamplona, being thus cut off from France. They left in the road 48 pieces of artillery, and at Vitoria and on the field of battle 151. I can get no account of killed, wounded and prisoners.[4]

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[1] Seven bridges were in the field of operations, none were broken or retrenched.

[2] On the 20th, Sir Thomas Graham had been sent across a small river to Murguia, and the day of the battle moved forward from thence on Vitoria by the road from that town to Bilboa, and threatened the enemy's right flank. *See* Wellington Despatches, Vol. X., p. 433.

[3] Wellington projected three distinct battles. Graham with a force of 20,000 men supported by some Spaniards moving on the Bilboa road was to shut up the French centre and left between the Zadorra and Puebla mountain. Hill with the 2nd division and some Portuguese and Spanish troops, some 20,000 men, was to force the passage of the Zadorra and menace the French left. Wellington with 30,000 men led the attack on the centre. *See* Napier, Vol. V., p. 554.

[4] The 151 guns include the 48 just mentioned; there were also taken 415 ammunition wagons. The French lost about 6000, the allies about 5000 men killed, wounded and prisoners.—(F.A.W.).

Having given a general description, I must now tell the part I personally took. Early in the day we feared that we and the cavalry should be left inactive; the first orders we had were to go to the centre bridge, wait till its defences were turned, and on the enemy's retreat, cross and support the light division. Accordingly the moment the enemy's right, which we helped along with a few shots, gave way, we crossed. At the moment I strongly recommended Gardiner not to follow Ross and the light division over the immense hill, but to go round it. In doing this we got on the high road and found the French centre resting there still unforced. Webber Smith's, two of Ross's, and Sympher's[1] guns all firing on it, though the ground was such that we were all commanded by their artillery, we also fell to, and the shots rattled amongst us in thousands but did no harm, and in about a quarter of an hour the 4th and light divisions forced the centre. The troop immediately limbered up and, taking the lead of all the artillery, away we pushed through the village. At this moment, as Harding has since told me, Lord Wellington turned to Dickson[2] and asked "what artillery it was?" and when informed, he said, "That is something like Horse Artillery." We came into action twice in the centre of the enemy's columns, but always, such was the nature of the country, on low ground. At the last place my favorite horse, poor Telemachus, was shot, Sutton being on him, and we had hardly got through the second village when in the act of leading my guns off the road to an eminence where we were to come into action, I received a ball in my knee, a subject however which I shall quit at present, detailing what afterwards happened to the troop. About the same spot where I was hit we had one man killed and thirteen wounded, twenty-six horses killed and wounded, and a shot cut in two the axletree of the howitzer limber, killed four of its draught horses, and left it a wreck.[3] Taking up a new position about 400 yards further on, the face of the country changed, and as Major Fraser, who was latterly with us and delighted with the conduct of the troop, assured me we paid the French off in great style, and continued to do so till we had expended all our gun ammunition.

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[1] Major Sympher, K.G. Legion.

[2] Lieut.-Colonel Alexander Dickson, Commanding R.A. (Kane's List, No. 844). The name and services of this distinguished officer are so well known and cherished in the regiment to which he was so great ornament, that it is needless to do more than enumerate the 17 battles, viz.: Buenos Ayres, Grijo, Oporto, Busaco, Torres Vedras, Campo Mayor, Albuera, Almaraz, Salamanca, Vitoria, Bidassoa, Nivelle, Nive, Adour, Toulouse, Quatre Bras and Waterloo; and the 18 sieges, viz.: Minorca, Malta, Monte Video, Olivenca, Badajos, Badajos, Ciudad Rodrigo, Badajos, Salamanca, Madrid, Burgos, St. Sebastian, Fort Bowyer, Mobile, Mauberge, Landrecis, Phillippeville, Marianbourg and Rocroy, at which he was present. He received for eminent services the G C.B., the K.C.H., the K.T.S. of Portugal. The Prussian Order of Merit. Spanish Gold and Enamel Cross for Albuera. The Portuguese medal for Peninsular war, and the Waterloo medal. Major-General Sir Alexander Dickson died, aged 63, in April 1840, when D.-A.-G. R.A., universally regretted by his brother officers, who raised to his memory a monument in the Repository at Woolwich as a token of their respect and esteem.

[3] Major Gardiner writing from Olite, July 2nd, 1813, about the services of the Royal Artillery and of the losses of his troop to the D.A.G. R.A. says, "You will be glad to know the services of the corps were conspicuous on this day [Vitoria]. 'E' troop suffered nearly as much as at Majalahonda, but in a different way, thank heaven. I had 19 horses killed and 10 wounded, one man killed, 15 wounded. My friend Swabey is among the latter and I can never cease to regret the loss of his services with the troop."

During this month "E" troop lost the services of another excellent soldier, Sergeant James Wightman (Kane's List, No. 1853) who was promoted Sergeant-Major of "F" troop, R.H.A. in which he was subsequently held in high esteem.

I must now return to my poor self. The moment I found I was hit I turned my horse round and quietly walked to the village where I met Sutton actually in tears at the loss of the horse, which he said was like losing his best companion. I laughed at him, and told him the state I was in, but still he kept prating about the horse; he helped me off and I got into the first hovel I could find. I found there the doctor with two or three of our men likewise wounded. As soon as they were dressed he came to me, and on examination we found the ball had to all appearances gone directly in between my knee-cap and the top of the leg bone, taking in the cloth of my overalls and drawers, and the piece in the wound not being entirely separated from the cloth outside, I vainly thought I could pull the ball out with it. In this I failed. The doctor then probed the wound and said decidedly the ball was not there, so that where it went God only knows. Whilst he was dressing us a cannon shot, and afterwards a shell, came into the building, doing us fortunately no other injury than that of knocking the tiles about our heads. The doctor being obliged to follow the troop, I sent Sutton and a man out on the road, who collected our poor fellows to the number of thirteen and brought them in. I succeeded by my entreaties in getting their wounds dressed or rather tied up. The army had now passed on and some of our men wanted to get into spring waggons, but I would not permit it, not knowing where they were to be taken to, and the doctor having promised to see us all before night. Things were in this state when back along the road came the spring waggons and all the lumber of the army at a gallop, with an alarm that the French cavalry had broken our line and were coming down the road. Though I did not much believe it, yet the alarm of the moment made me, in spite of the pain, get on my horse, an action which has been the cause of much swelling in my wound. I would not however get off till I had ascertained the fact or seen the enemy, though many of the poor fellows went off wounded as they were; poor Corporal Fraser however, having his leg broken, lay still with the most heroic resignation. My baggage had meanwhile arrived and I ordered my servants to unpack my two mules and my led horse, that some of them might escape on the animals; fortunately the alarm turned out false, and after some time both the baggage and men were collected again in the hovel. The interval between the doctor's departure and his expected return was long and anxious, though I will say the fortitude which the men displayed was truly admirable; for although men of other regiments and Frenchmen were groaning all around, not a complaint was uttered, and nothing was said or done but rejoicing over the success of the day and assisting each other.

Towards evening I was enabled to buy some bread and wine, which was as acceptable to the men as it was to me. At last, when no doctor appeared, I for a moment almost lost my courage, but thank God it was only for a moment. Seeing clearly that I was to be there all night I had my baggage unpacked, my mattress spread out and lay down to sleep which, being very tired and my wound not yet stiff and painful, I at length accomplished, making Marsland[1] lie on one side of me and a

[1] One of the men of 'E' troop badly wounded at Majalahonda, and who was assisted during the retreat from Madrid in 1812 by Lieutenant Swabey, whose servant he afterwards became.—(F.A.W)

Frenchman who was wounded in three places on the other. About 10 o'clock in came Macdonald who seeing me inclined to sleep recommended me not to move till the next morning. He used all his endeavours to get the men off in cars or spring waggons to Vitoria, but as these carriages are all attached to particular divisions and none to the cavalry itself, and were employed in their own departments, it could not be done. As he was absolutely obliged to rejoin his troop, we determined that I should ride in to Vitoria in the morning, get settled if possible in a house, and as head-quarters were there, make such representation to Colonel May as would ensure some assistance for the men; this settled, he left me to my contemplation. I must here own that the enthusiasm and glory of the moment had so got the better of me that I had not till now turned my thoughts to the Author of all destinies and events; may I say here that I recollected my duty in this point and waited with patience for day-light.

22nd June.—As soon as the sun rose I tried to move, but found my leg had become stiff and swelled and perfectly motionless, so that I cut a strange figure supported by two men. I had great difficulty in mounting, but when on managed tolerably well, Sutton leading my horse very slowly. On all sides of the road the dead, dying, and wounded yet unmoved, were to be seen, and I found reason to thank my stars that I had come off so well. The road was tedious to Vitoria, and I lost my patience several times at the carelessness of people with baggage and horses, who seemed to think nothing of jostling against me; muleteers firing muskets in every direction made my horse start, much to my annoyance. On arriving at Vitoria the first intelligence I could get was that there was no hospital established there; the idea of going back a league almost unmanned me, and the difficulty I found in getting into a house to sit down till I could learn some certain intelligence was in my situation not enviable. At length I found the house of Bradley,[1] our head-quarters regimental surgeon, he was out, and his room up two pairs of stairs. The people actually refused, notwithstanding the state I was in, to open the lower room for me to sit down. I heartily cursed their inhumanity and went to another house where I remained whilst Sutton went to find Harding. Through his kindness I soon got removed to Colonel Dickson's quarter and put to bed, and Colonel Dickson moving immediately after with head-quarters the people of the house promised to take care of me, and Bradley was left to look after me and Woodyear[2] who is likewise wounded. I had the satisfaction to find too that all my men had been taken to hospital.

23rd June.—In consequence of my leg being swelled no further dressing is yet put to it, and operations are confined to bathing it with goulard water, to which I am happy to say the inflammation begins to give way.

There have been taken 151 pieces of artillery, 60 caissons, 70,000 rounds of gun and 1,000,000 of small-arm cartridges, nearly all the

[1] Surgeon Nicholas P. Bradley (Kane's List, No. 78).

[2] Lieutenant Lumley Woodyear (Kane's List, No. 1343), Acting Brigade-Major, R.A. died at Bilboa, 1st September, 1813, from wounds received at the battle of Vitoria.

baggage, a great treasure in money, and many of the royal carriages, etc.; so far facts, reports say 11,000 prisoners, this is yet to be confirmed.

24th June.—I was very sorry this morning to lose Mr. Bradley who is obliged to follow the army: he has left me in the hands of Mr. Rudge,[1] the surgeon of Parker's[2] brigade, which is remaining here to form a depôt of artillery stores. I am, thank God, in no great pain nor in any great apprehension as to my wound and have not yet suffered myself to despond.

25th June.—I employed great part of this day in writing, which I hope to find a source of employment sufficient to pass away the dreary hours, no change of any consequence has as yet taken place in my wound, except that suppuration is now beginning.

26th June.—The army partly invested Pamplona to-day. It appears that provisions were only thrown into it on the 21st, and that had we arrived sooner it would not have stood a siege, as it is, Major Frazer, having volunteered to bring up the battering train from Santander, passed through this evening.

Jourdan[3] has retreated and got on the road to Bayonne where most probably he is by this time; how soon we shall see him again I do not know. In the meantime Clausel's division, which is cut off, has taken its route towards Saragossa in hopes of uniting with the force from Alicante which is marching northward. The enemy had on the 23rd only two pieces of artillery left, one of which Ross destroyed by a shot from one of his guns.

The loss of the French in killed and wounded is very great.

This day began to poultice my wound.

The French lost both these guns under the following circumstances:—(F.A.W.)

About 6 o'clock on the morning of June 23rd, the advance-guard overtook the retreating enemy with the two guns they had saved at Vitoria. A cry was at once raised for artillery, upon which a gun of Ross's troop under Lieutenant A. Macdonald galloped up the road, unlimbered and plied shot and shell with such effect that it dismounted one of them. Seven of the enemy were disabled by one shell.

Two hours later our troops came in sight of the French using every effort to carry away their last field piece. Lieutenant Belson's division at once came into action, and the enemy seeing their case was hopeless, threw the gun over a precipice and continued their flight. At this moment Lord Wellington

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[1] Assistant Surgeon Edward Rudge (Kane's List, No. 199).

[2] 2nd Captain J. B. Parker (Kane's List, No. 1117), he commanded No. 5 Company 9th Battalion (now 15th Western) in the absence of 1st Captain Henry Stone employed in Persia. Parker lost a leg at Waterloo and was afterwards known as "Peg Parker." In his lately published interesting "recollections" Sir John Adye tells a good story how when riding across the Common at Woolwich with the Cadet Company, Lieut.-Colonel Parker unwittingly dropped his leg, which was picked up and politely returned to him. Major-General Parker, C.B., was Lieut.-Governor of the R.M. Academy from 1st April, 1846, till his death on March 25th, 1851.

[3] Marshal Jourdan, Chief of the Staff to King Joseph Bonaparte.

rode up to Belson[1] and congratulated him on having deprived them of their last gun. *See* "England's Artillerymen," p. 169.

27th June.—A corps under Sir Thomas Picton consisting of the 3rd, 5th and 6th divisions, was detached this day and marched to watch and defeat Clausel,[2] and perhaps also Suchet's *ci-devant* army. I therefore fell into the hands of a third surgeon, an officer of the line. I should feel much more contented if some of our own medical officers were settled here; however, having accepted the situation I will not complain. It is now that I must call to my assistance those principles of resignation to the divine will in which the affection of a kind and virtuous mother educated my early years, and of which under much suffering she was so bright an example.

28th June.—Little variation in the prospect of a sick bed and a fish diet. To-day reports say that Lord Wellington himself is marching by way of Saragossa, and it is hoped that Suchet's force will thus be given a good account of.

29th June.—I employed great part of the morning in drawing up a memorial which I hope to induce the subaltern officers of the regiment to get presented to the Prince Regent, praying permission for them to be admitted to employment in staff appointments, and further laying before him a statement of the very unfavourable and depressed state of our hopes on the subject of promotion; praying his gracious consideration and assistance.

1st July.—My operations were confined to-day to reading Gil Blas. I think in time I shall be pretty well acquainted with the history of that hero.

2nd July.—I had thought it lost time to speculate on the probable time of my departure from this paradise called "Bedfordshire"; my surgeon however talks of to-morrow or next day. This is the first time in my life that I was ever tired of bed, and what is more astonishing I am even tired of pastry, a thing which I never could have dreamt would happen to me.

3rd July.—It appears almost incredible that in six weeks march,

[1] Lieutenant George John Belson (Kane's List, No. 1235) served in the Peninsula and South of France in "A" troop, R.H.A. from July 1809, to the end of the war in 1814, including the retreat from Talavera, action in front of Almeida, action of the Coa, battle of Busaco, actions of Pombal, Redinha, Cazal Nova, Foz d' Aronce and Sabugal; battle of Fuente de Honor, actions on the heights of the Agueda, sieges of Ciudad Rodrigo and Badajos, action at Castrajon (severely wounded), San Muños, San Milan and Osma; battle of Vitoria, action with the French 23rd June 1813, the morning before they entered Pamplona, in which he captured their last gun from Vitoria; battles in the Pyrenees, passage of the Nivelle, Nive, and Gâve d'Oleron; battle of Orthes, besides various minor affairs and skirmishes, 33 engagements in all. He received the war medal with nine clasps. Major-General Belson shortly before his death at Woolwich, in 1868, in a conversation with the author of "England's Artillerymen," confirmed the particulars of the capture of the last French gun after the battle of Vitoria.

[2] General Clausel was one of the ablest of the French generals who served in the Peninsula. Napoleon had a high opinion of his capacity. On his voyage to St. Helena he said, "He considered General Clausel to be decidedly the most able military officer now in France. Marshal Soult and other Maréchals were, he said, brave and able men for carrying into execution operations previously planned, but to plan and execute with large armies, in his opinion none of them were by any means equal to General Clausel." "Taking Napoleon to St. Helena," *Century Magazine*, November, 1894.

Lord Wellington should have made himself master of Burgos and Pancorvo, drawn Suchet from the south, crossed the Ebro, beat José at Vitoria, established his head-quarters within a few leagues of France itself, invested Pamplona, ensured his communication with Santander, and put himself in a state to defy any attempts to move him.

4th July.—The troops sent to watch the movements of Clausel's division returned to-day after an unsuccessful march, he having crossed the Ebro at Saragossa, with the intention most probably of joining and strengthening Suchet. Lord Wellington leaves a corps of cavalry at Tafalla, and Spaniards to watch the Ebro at Tudela.

> This movement was very succinctly described to Mr. Croker by the Duke of Wellington in the following terms.—(F.A.W.)
>
> "During the movements preceding the battle of Vitoria I had heard of the armistice in Germany. I hastened my movements at Vitoria because I knew a reinforcement of 20,000 men was advancing under Clausel, while I had only 6,000 coming up under Packenham. Their outposts met, but Clausel did not attack him, and I had made arrangements for falling on Clausel with my whole force; and should probably have overtaken, and defeated him and his army, but that in spite of my positive orders that there should be no wandering, a certain officer of dragoons chose to be taken prisoner while he was at dinner in a country house, and Clausel became aware of my movements, and hurried away so fast, and in such a direction that I did not care to follow him. On what slight accidents turn events."—Croker papers, Vol. I, pp. 335-6.

5th July.—It is understood that the siege of Pamplona is given up as it is said to be only provisioned for two months, and its strength such that it is estimated 12,000 men would be required to take it, Lord Wellington has therefore left O'Donnell to blockade the place with 12,000 Spaniards, by means of an intrenched camp. The army is gone to take possession of the different passes.

6th July.—I received a letter from Gardiner who has been employed with the corps in pursuit of Clausel, who instead of joining Suchet has made his way over a central pass into France.

7th July.—I remain very much puzzled at the conduct of Clausel. Had the French any intention of continuing masters of Spain it appears odd that he should not have attempted to join Suchet. What the object of the movements of the latter is I cannot guess, it must entirely depend on the information he receives as to the extent of the defeat sustained by José, and the promises held out of future co-operation. It is a well-known fact that the grand scheme of military policy first introduced in the wars of the Republic, namely, the corresponding movements of separate bodies, has in this campaign been interrupted by Suchet considering himself an independent commander. The French want of information is likewise inconceivable, of this we have a fresh proof in the 800 men who surrendered at Pancorvo, a body of

troops who had taken refuge there merely because they were lost and isolated, the garrison having been long withdrawn.[1]

8th July.—I do not know precisely the date of the occurrence, but the 2nd division under General Hill met with a repulse recently in taking possession of the Maya Pass in consequence of the 7th division not arriving in time to its support; the enemy however left the pass in the morning.

Lord Wellington writing to Lieut.-General Sir Thomas Graham on this day gives exactly what happened.—(F.A.W.)

"My time has been so much occupied by reconnaissances and by Sir Rowland Hill's operations for the last three or four days that I have been unable to write to you. The enemy appeared particularly anxious to keep hold of this fine valley of Baztan; and Gazan has disputed every position in it; and it was necessary to reconnoitre each of them very closely before it was attacked, which in these mountainous countries is not very easy. However, we have at last got him out. He had three divisions yesterday in the Puerto de Maya, the last position in Spain too; and a very strong one it is. We had not quite enough troops up, we manœuvred with two British and one Portuguese brigade and a half. If the 7th division, which was ordered, had arrived in time, or the sea fog had held off for an hour or two longer, we should have made a good thing of it. Our loss is about 60 wounded." Wellington's Despatches, Vol. X, p. 512.

9th July.—Lord Wellington is daily employed in examining the different passes of the Western Pyrences, with the view of shutting out the French. I have so often talked of the insincerity of Spanish manners that I scarcely need say that the attention of my friends, in whose house I am, begins daily to diminish, and I am now treated as an inconvenience.

10th July.—I had the vanity after being up two or three days to think myself capable of going out, my surgeon having no objection, so I strolled to see Woodyear, whom I was glad to find much better and sitting up.

11th July.—Went to Woodyear's to see from his windows the ceremony of proclaiming the "constitution." A stage that had taken a week in erecting, but which by the same number of workmen in England would have been completed in one afternoon, was covered with chairs and decorated with flowers and evergreens for the reception of the Governor and his procession which came at one o'clock. They were escorted by two or three of what they called regiments of infantry, all originally of the same uniform, but whom want of discipline and jealousy of instruction, had reduced to a set of many coloured raga-

[1] This is not quite correct. When the French retired across the Ebro previous to the battle of Vitoria, they left a garrison of about 700 men in the castle of Pancorvo, by which they commanded and rendered useless to the allies the main road from Burgos to Vitoria. The Conde de la Bisbal was therefore directed to seize the town and blockade the castle, with the result that the latter capitulated on July 1st.—*See* Wellington Despatches, Vol. X, p. 503.

muffins. The civil part of the procession was well conducted, and the constitution audibly proclaimed. It was likewise necessary to proclaim Ferdinand King; it did not seem clear to the Spaniards themselves that some few villains might not be found to dissent from the general acclamations of joy; of this I had no fear and my expectations were justified. I never saw in any part of Spain I have been in a single mark of disloyalty amongst the inhabitants, though uniformly I have had to lament that there was nobody of sufficient character, abilities, or influence to guide the good disposition of a people who had no government to direct their efforts.

I believe the revolutions of most countries have produced energetic and enterprising characters who have risen from the ruins of the times. But in Spain, had such men been found, the insufferable arrogance of all ranks would have prevented their counsels being followed, and the neglected state of all mental endowments has been so general, as to produce no such characters. Except the Marquis of Romana[1] there has been no one of sufficient intelligence to see the interest of his country in its true light, and he unfortunately was not alive to it till after the moment for action was gone by, which has happily now again returned owing to the late successes.

12th July.—Happy will Spain be if she is enabled to preserve her liberty when a few years under the new constitution have tested the legislation of those into whose hands it has committed the administration of justice and the protection of individual rights. The impoverished state of its provinces however will be for a long time an obstacle to its success; for instance, the scheme of general instruction cannot yet be pursued. I shall not attempt to prophesy that the new government will have the success which I wish it to have, even though it is the structure to which happiness and an equal distribution of property are willing to trust themselves. In all changes the ignorance, the prejudices, and the superstitions of people are to be combated, and the genius of a nation may render the most perfect model unavailing to their happiness. I could have wished for the sake of this experimental government that property had changed masters more than it has.

In every new publication I see the Spanish revolution compared, not in the course of its history, but in its consequences, to the hellish subversion of order that took place in France, a storm which bid fair to be succeeded by a calm until it was again aroused by oppressions arising from the necessities of war. But in no one feature can I trace the justice of the comparison. Spain has been impoverished, and individuals have been ruined, but the terrible hand of murder has not been seen, neither have executions under the sacred veil of legality been inflicted by the French army. I have seen no massacres, but few remains of burnt towns, nor indeed any violence that has not been immediately occasioned by war conducted by disciplined troops under the

[1] Marquis de la Romana, a Spanish General born in 1761, distinguished himself in the campaigns against the French on the Pyrenees frontier 1793-95. When Spain rose against the French in 1808, La Romana played a prominent part in the war. He died of heart disease at Cataxo, on January 25th, 1811. Wellington greatly deplored his loss, he wrote, "I don't know how we are to replace him."—(F.A.W.)

restraint of authority. Noblemen's estates, though uncultivated, have not passed into other hands, and in short, during the five years war of invasion the order of things seems to have been rather suspended than subverted. The only subversion is the legal adoption of a new government holding out protection to the poor, and the execution of justice unsullied by aristocratical, or what is worse, ecclesiastical influence. Should Ferdinand ever return to the throne he will not be in a position to oppose the transference of power from his own hands into those of a mixed government having restraint on the regal prerogative, nor do I think he will be blind enough to the real interest of Spain to wish to do so.[1]

13th July.—Every preparation is being made to attack St. Sebastian where there is a garrison of from 4000 to 5000 men. The place stands on a commanding sort of isthmus running into the sea, and flanked on the land side by a creek. The principal obstacle to its attack is the castle which occupies a very commanding position, it has a horn-work and a Moorish wall which protects the only side where breaching batteries can be erected, and this has first to be breached by firing across the creek. On the sea side I conclude, though I am not certain, that an attack is impossible. Where the isthmus joins the main land is a convent which forms a sort of out-work. This was breached by Morrison's[2] 18-pounders and was then carried with little loss.

14th July.—The Spaniards having pickets at St. Sebastian were surprised and nearly all taken in a sortie, they having very quietly gone to sleep in a house, which is characteristic of them.

15th July.—I understand that our divisions which occupy the passes have their outpost in France. This may be necessary for the sake of information, but I highly disapprove of Spaniards levying contributions on France, which has likewise been done. No man can blame them if they resort to hard measures, and we have seen what the French are capable of when invaded. I conceive we cannot adopt a plan more likely to reanimate their beaten army, or to make new soldiers and volunteers for them; these are not to be despised in mountains, where irregular troops can act to some advantage.

16th July.—My leg having been for some time stationary, I consulted a Mr. Gunning, a surgeon of known eminence sent here on purpose to assist in obscure cases, who on probing my knee pronounced very decidedly that, though he could not find it, the ball was there, and he said he felt cloth or some foreign body in the wound, to extract which he proposes to-morrow morning to cut the wound open.

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[1] Nevertheless this is precisely what Ferdinand did.—(F.A.W.)

"On his restoration to the throne, in March 1814, he refused to swear or accede to the constitution of the Cortes, as interfering too much with the free exercise of the regal authority. And from the moment that he assumed the reins of government a series of transactions took place which excited the astonishment and disgust of all liberal-minded politicians in Europe. Instead of the promised constitution, there commenced a fearful system of persecution against all who were suspected of holding liberal opinions; and executions, imprisonment, exile, and confiscation of property reigned in all parts of the kingdom. The monastic orders, the Inquisition, and the rack were restored. At length, in January, 1820, an insurrection broke out, and Ferdinand was compelled to restore the constitution of the Cortes of 1812, but the French government interfering by force of arms absolutism was restored in Spain in 1823." *Chambers Encyclopædia.*

[2] Captain William Morrison (Kane's List, No. 934).

17th July.—When the tormentor came, whose arrival I anticipated, I had had time to think with dread of his knife, though yesterday he might have amused himself with cutting as much as he liked. He probed again, and said he could distinctly feel a piece of loose bone. He had changed his mind about cutting, which I did not disapprove of, and had recourse to another scheme for extending my wound, of which I know not the technical term; but it consists in soaking sponge in melted wax, then forcibly compressing it and leaving it to dry. It is then cut into pegs, which are then inserted into the sinus of the wound, and the wax melting the sponge expands and forcibly opens it, to the no small annoyance of the patient, who is obliged to keep his bed and does not fail to curse the invention.

18th July.—The first peg having done its office, a second was inserted of a larger size, I being obliged to be all day in bed and for the first time suffering pain.

19th July.—The ceremony was again repeated with larger pegs, but as they did not happen to take to expanding I did not suffer so much though still in bed.

20th July.—A thorough opening being now made, no less than two wiseacres gave my knee a thorough probing and examination, but nothing could be found, so that between their opinion and Gunning's I know not what to think; however, as they all now agree that the ball is in my knee they look on my recovery as distant, and recommend my going to England which at length I have consented to do. I accordingly sit down to write home on the subject. It is unlucky to be obliged to go to England because here is the place where I must lay the foundation of future fortunes.

22nd July.—To-day I hear that under Sir Thomas Graham the breaching batteries were opened against St. Sebastian, and that the siege is conducted by Sir R. Fletcher[1] and Colonel Dickson, with Frazer and Hartmann[2] under them.

Frazer and Ross are gazetted as Lieut.-Colonels, and Jenkinson as Major in consequence of the Vitoria business. I do not yet know if this will be succeeded by other promotions, but as our troop was noticed in the field by Lord Wellington, and as amongst the extensive loss of the R.H.A., in men and horses, ours formed a half of the whole, I really thought that Gardiner stood a fair chance. On the other hand, Ross's and Jenkinson's long service in the country, and the success of the memorial drawn up by the latter certainly were prior claims; perhaps one action hardly deserves a second promotion, yet I wished for it as it would have inspirited the troop. Frazer's Lieut.-Colonelcy is a compliment to all the Horse Artillery, which their high state of efficiency and almost constant employment has justly merited. Norman Ramsay I should have thought would have been promoted, but unfortunately about the time the despatch was sent, Lord Wellington was

[1] Lieut.-Colonel Sir Richard Fletcher, the distinguished Engineer of the Peninsular War. He was made a Baronet for his services at the Sieges of Ciudad Rodrigo and Badajos, and was killed during the assault on St. Sebastian on 1st August, 1813.—(F.A.W.)

[2] Lieut.-Colonel Julius Hartmann commanding the Artillery, King's German Legion.

very angry with him for being with his troop in a place where his Lordship did not expect him to be, notwithstanding that his orders bore him out in being there. Lord Wellington would listen to no reason or explanation, and as Major Frazer informed me, raved like a madman to Colonel Dickson, applying to Ramsay every ungentlemanly and vile epithet that ever disgraced Billingsgate. It was fortunate that Norman was not in the way, as Frazer declared no man under any circumstances could have brooked the abuse. It is singular, for Lord Wellington has been heard so often to speak in terms of the highest applause both of Ramsay and the troop. He, however, put him in arrest, and it is thought withheld the recommendation he might otherwise have given. I mention this more as an anecdote of Lord Wellington than as connected with my journal, and it is a very fair characteristic of him when displeased. I have more pleasure in recording the liberality of Sir Thomas Graham, who a few days afterwards, when the troop was engaged, suspended the arrest and put Ramsay at the head of it, sensible of the injustice done him; few of our Generals would have ventured on such a step.[1]

The subject of Norman Ramsay's arrest has been always regarded with sympathetic interest in the Regiment, I therefore give the accounts, identical in all respects, as related in after years by Lieut.-Colonels Blachley and Cator to the latter's son, now Sir J. Farnaby Lennard (late R.H.A.), who has kindly sent it to me.—(F.A.W.)

"After the battle of Vitoria when every effort was made to press the French, Lord Wellington at a certain spot on the Salvatierra cross road which runs between those leading to St. Sebastian and Pamplona overtook Ramsay's troop. He gave Ramsay orders to remain there until he had personal orders from him and rode on. The troop accordingly encamped. Early next morning one of the Quarter-Master-General's Staff, I forget his name but he was a prig, came up with orders to Ramsay to move to Pamplona. Ramsay who was a very lazy man, and only the gallant and brilliant soldier when under fire, was in bed in his tent. My father went to him with the Staff Officer who gave him his orders. Ramsay asked, 'Am I to take this order as from Lord Wellington, for he gave me positive orders not to move without personal orders from himself.' The reply was, 'this order is from Lord Wellington,' upon which with much hesitation Ramsay prepared and marched. The troop had not gone far when his Lordship with his own Staff came to the spot where he had left it the evening before; he was very angry at not finding Ramsay, and galloped after him. When he overtook it the troop was halted at a small river, the bridge over which had been blown up by the French. He addressed Blachley

[1] Sir Thomas Graham was a much older man than Lord Wellington, being at this time 68 years of age. It is noticeable that the latter always addressed him more formally in correspondence than in communicating with other General Officers in the army. Sir Thomas wrote a letter on behalf of Ramsay but it was not well received by Lord Wellington.—(F.A.W.)

the senior Subaltern, 'Where is Captain Ramsay?'—'Gone up the river to find a ford.' 'Who is next in command?'—'Captain Cator.' 'Where is Captain Cator?'—'Gone down the river to find a ford.' Lord Wellington then turned to one of his Staff and said, 'Place Captain Ramsay under arrest and order Captain Cator to take command of the troop.' My father got his orders and the Staff went away. Everything was done to explain the circumstances, but Lord Wellington's reply was always, 'if I can't get an officer to obey my personal orders he is no good to me.'"

Sir John continues—

"I have heard my father, Alec Mac[1] (as he was called by his pals), Brereton, and Henry Blachley often talk about Ramsay's arrest, and when I was in Spain, at St. Sebastian, after the Carlist war[2] was over, I went, with the aid of 'Napier's Peninsular War,' to the very spot where the bridge stood which the French had blown up, and where Ramsay was placed under arrest. It was very interesting.

I remember also the following incident being spoken of in connection with the battle of Vitoria.

During the battle 'I' troop had almost fired away all their ammunition. Ramsay told my father to fill up the waggons with what was left in his part of the troop and to go to the rear for more. This was done. On his way to rejoin the roads were impassible and the half troop had to go across country; the plain of Vitoria is low with wide ditches; as they proceeded they overtook a regiment of cavalry pounded. The limber gunners got out their spades and made a way across for the guns, which enabled the cavalry to follow, and by this means they were in time to take part at the close of the action."

Norman Ramsay remained in arrest till after the fall of St. Sebastian and the entry into France. During these operations he remained with the troop and appears to have performed ordinary and routine duties as, between May and December 1813, the muster rolls and pay lists are all signed by him. His arrest seems only to have precluded him from taking command in the field. But though we do not know the actual date of his release we have an account of what took place from the pen of Assistant Commissary Henegan[3] who was present. —(F.A.W).

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[1] The younger of the two Alexander Macdonalds, both of whom were C.B.'s, he served throughout the Peninsular War in "A" troop, and was 2nd Captain of "H," Norman Ramsay's troop at Waterloo. General Macdonald married a sister of Brigadier-General Fox-Strangways who was killed at Inkerman.

The elder Alexander Macdonald commanded the six troops of Horse Artillery attached to the cavalry at the battle of Waterloo. Neither of these officers must be confused with the *Robert* Macdonald who commanded "E" troop during a portion of its service in the Peninsula.—(F.A.W.)

[2] The Carlist war terminated in 1839.

[3] Later Sir Richard Henegan (Kane's List No. 35, page 195).

"The next morning at Villa Franca I was breakfasting with Norman Ramsay and the officers of his troop, now commanded by another, when General Vandeleux arrived. Upon entering the room he went up to Ramsay and grasping his hand with a brother soldier's warmth, said:

'The object of my visit Captain Ramsay is to inspect your troop.' 'My troop,' General, 'is mine no longer,' answered poor Ramsay with deep emotion.

'I am glad to say you are mistaken Captain Ramsay,' rejoined the General, 'for I am the happy bearer of orders from Head-quarters, that authorise me, as I before said, to inspect your troop. The command of it is restored to you.'

Ramsay overcome by his feelings turned away and wept, while every officer present, and none more cordially than Captain Cator[1] who had superseded him, gave vent to their joyful feelings at this happy termination."

Norman Ramsay subsequently commanded the troop at the battles of Nive and Nivelle, and in the affairs on the 11th, 12th, and 13th of December near Bayonne. He was made a brevet Major November 22nd, and promoted 1st Captain December 17th, he returned to England on promotion early in 1814. Of Ramsay in the campaign of 1815, we have the following on the authority of the late Sir William Brereton then a subaltern in his troop.—(F.A.W).

"During the retreat from Quatre Bras, Ramsay was wounded in the head, and wore a forage cap on the 18th of June. On the morning of that day as he went into action at the head of his troop it passed the Head-quarter Staff. The Duke who had not seen him since his arrival in Belgium, accosted him cheerfully something to the effect 'Very good' or 'Well done Ramsay.' The latter saluted profoundly bowing until his head almost touched his horse's mane, and then passed on to the position where he so nobly fell."

To return to the diary—

23rd July.—I had a visit from Doctor Irwin, a great man here, who on mature deliberation with my surgeon decided on leaving my wound to itself, condemning me to have my leg constantly on a chair and never to move, judging that any attempt to extract in the dark would be dangerous and useless, the ball is therefore left to come out of its own accord if it chooses, but I conceive it to be so buried as to injure the motion of my leg; time can alone tell the true state of the case.

24th July.—I have as yet been very patient under the enforced

[1] 2nd Captain William Cator (Kane's List No. 1134) served in the Walcheren campaign, Capture of Middleburg, Siege of Flushing.

He served in the Peninsula and South of France from 1809 to 1814, including the siege of Cadiz, lines of Torres Vedras, at Santarem, battle of Barrosa (wounded); affair of Osma, battles of Nive and Nivelle, actions of Bayonne.

He commanded the R.A. of the expeditionary army send to Turkey in 1854, but through ill-health returned home before hostilities began. General Sir William Cator died a Colonel Commandant R.H.A. in 1866.

solitude and restriction. Breakfast in bed, get up, go to a chair, sit perfectly motionless until a dinner of fish and potatoes with pudding, no wine, yawn an hour and then go to bed. Now had I a book or society I might drag on, but as it is, it is literally no better than the Bastile.

25th July.—A little while ago we heard of the armistice between the Russians and French.[1] Though as yet I am not without hope that it may be untrue, as I should look on it as the final blow to Spain and to the gleam of hope that Europe has enjoyed of breaking through the bonds of tyranny. The circumstance of Murat's having opened a trade with Sicily affords me a glimmering of a scheme between him and Austria to restore the Italian States, Sardinia, etc.

26th July.—Having been to the window by accident, I was surprised at the change in the shops now filled with English goods and showing signs of trade. This place, from its vicinity to Bilboa, was one of the most opulent towns of Spain, and in consequence of trade much better provided and more advanced in the ways of the world than I presume any place except the ports of the eastern coast, and Madrid.

27th July.—Various reports about an action near Pamplona are in circulation. It would seem an unlikely direction for it to have taken place.

28th July.—The accounts of a battle still gain ground and preserve their consistency.

29th July.—The wounded began to come in, but as yet I have been able to learn nothing certain about what has occurred.

30th July.—I shall not at present vouch for the circumstances, but it appears that Soult, having arrived in the Pyrenees, under the title of Regent of Spain, had collected all the force he could, backed by 30,000 peasants and surprised the pass occupied by General Hill, with the view of penetrating to Pamplona, and I suppose of either carrying off the garrison or throwing in supplies. I cannot think that his intention was to remain, as he could bring no artillery where he made his attack; nor do I suppose his army was calculated to do so. Another object was to raise the siege of St. Sebastian. The story goes that General Hill after resisting these attacks by overwhelming numbers was driven with the loss of camp equipage from the pass and followed towards Pamplona, two leagues in front of which he took up a position. He was joined there by the greatest part of O'Donnell's army, and by other divisions of our troops. I know not which or whether all were there, nor do I know if Lord Wellington commanded. They were attacked three times, but completely defeated the enemy with it is said a lost of 14,000 men killed and wounded and 8,000 prisoners. Being cut off from the pass, many dispersed in the mountains, and some retreated on the Bayonne Road.

[1] This was the armistice of Pleswitz concluded between Napoleon and the Russians and Prussians for six weeks on June 4th after the battles of Lutzen and Bautzen in May 1813. This has been considered a turning point in Napoleon's career, and that had he then acceded to the claims of Austria or even restored her the Illyrian provinces taken in 1809, she would probably have remained neutral, in which case the coalition was certain of defeat.—(F.A.W.)

The 1st division had left St. Sebastian blockaded by Spaniards and marched to join General Hill. The siege will now be resumed; an unsuccessful attack on a breach was made and failed, it failed because instead of attacking it when first practicable, time had been allowed for the erection of works within.

31st July.—Still uncertain about the real history of the attack that took place on the 28th.

What actually happened was as follows.—(F.A.W.)

"As *Lieutenant de l' Empereur,* Marshal Soult, was sent to the Pyrenees to command the French armies in Spain and South of France. On July 24th, he attacked the allied post at Roncesvalles; it was held during the day, but being turned in the afternoon, General Sir Lowry Cole withdrew in the night.

The same day the position at Puerto de Maya was attacked; after some vicissitudes in the combat it was maintained, but the withdrawal of the troops from Roncesvalles compelled Sir Rowland Hill likewise to retire. On hearing of these engagements, Lord Wellington concentrated and reinforced these troops, assumed command, and on July 28th fought and defeated Soult at the first battle of Sorauren."—*See* Wellington Despatches, Vol. X, p. 575, *et seq.*

1st August.—The town begins to fill so much with wounded that it is necessary to send off all that can be moved to Bilboa. It is said the allies have lost 5,000 men in the affair.

2nd August.—In reading the French work of M. La Borde, *Itinéraire descriptif de L'Espagne,* my vanity is not a little gratified to find the following passage among others, which seems written on purpose to confirm my estimate of the Spanish character:—

"*Un faux orgueil, resté des temps féodaux, un prejugé barbare qui faisait de la guerre le seul état noble, arrêtaient ses heureuses dispositions.* (speaking of improvements in manufactures, literary education and agriculture as introduced by the Moors). *Il leur paraissait honteux de succéder dans ces occupations matérielles à leurs ennemis vaincus. L'habitude de la sobriété, l'orgueil de l'indépendance et de la gloire militaire, les empéchaient d'estimer assez le luxe pour lui sacrifier la jouissance tranquille de la vie et les prejugés de l'amour propre. L'Espagnol eut toujours le courage des privations mais jamais celui de travail, il a moins encore le pouvoir de surmonter la honte qu'il y croit attachée. C'est cette disposition antique et éternelle qui rendit l'expulsion des étrangers si fatale a l'Espagne, etc. Par une bizarrerie singulière la domesticité en Espagne parait moins déshonorante qu' une profession quelconque. 'Pendant ce temps' dit-on 'la noblesse dort mais le commerce s' éteint.'*"

3rd August.—I received so much confirmation of the different reports I had heard as to make me certain of considerable, if not general actions having taking place on the 28th and 30th, and exclusive of wounded, 3,000 prisoners being made on the 31st.

End of Diary.

The severe fighting in the Pyrenees cannot be better described than in Lord Wellington's own words.—(F.A.W.)

To Earl Balhurst, August 3rd, 1813.

He writes—

"We have had some desperate fighting in these mountains, and I have never known the troops behave so well. In the battle of the 28th we had hard fighting, and in my life I never saw such an attack as was made by General Barnes's[1] brigade of the 7th division, upon the enemy above Eschalar yesterday; the loss of the French is immense. I understood that they say themselves that they have lost 15,000 men, that is what I estimate their loss; but if they acknowledge that number, I ought to estimate it at 20,000 men, which is the number more generally believed."

To Lieut.-General Sir Thomas Graham, August 4th, 1813.

He writes—

"The French army must have suffered terribly. Between the 25th of last month and the 2nd of this, they were engaged seriously not less than ten times; on many occasions attacking very strong positions, in others beat from them and pursued. I understand the officers say they have lost 15,000 men, I thought so, but as they say so, I now think more. I believe we have about 4,000 prisoners. It is strange enough that our diminution of strength to the 31st does not exceed 1500 men; although I believe our casualties are 6,000 men."

To Lieut.-General Lord W. Bentinck, August 5th, 1813.

He writes—

"I never saw such fighting as we have had here. It began on the 25th, and excepting the 29th, when not a shot was fired, we had it every day till the 2nd. The battle of the 28th was fair *bludgeon* work. The 4th division was principally engaged; and the loss of the enemy immense. Our loss has been very severe, but not of a nature to cripple us."

Conclusion.

Lieutenant Swabey left the army on sick leave soon after the last entry in his diary, which ends abruptly, and did not rejoin his troop till April 1814, just in time to take part in the battle of Toulouse. He was shipwrecked during his voyage to France, but of this, and the other events of the time, there is no record by his pen. Nor, it is greatly to be

[1] The attack on a part of the French army in a strong position on the heights of Eschalar on August 2nd, 1813, by the gallant Barnes, caused a distinguished officer to say, "Barnes set at the French as if every man had been a bull dog and himself the best bred of them all." Waterloo Roll Call, p. 28.

regretted, is there in existence any journal of the campaign in Belgium in 1815, in which he took part; it was apparently lost, for in subsequent years he tried to rewrite it from recollection; but the attempt seems to have been unsatisfactory since after a few pages it was abandoned.

As stated at the commencement of this narrative, Lieutenant Swabey retired from the service in 1825, and in 1840 emigrated to Prince Edward Island. This latter step being largely due to his love of sport, and he took out with him his horses and a pack of hounds, chartering a vessel for the purpose. The hunting proved a failure, the transatlantic farmers in no way appreciating this form of amusement, but the shooting made some amends for this disappointment, as it was not only plentiful, but the whole country free to the sportsman, and no shooting rights to infringe. He was well known as a hard rider in his early days; "Swabey's leap" over the brook near the village of Salford, Bedfordshire, is still pointed out to the visitor. Eighty years of age still found him able to shoot for a considerable portion of the day.

The bullet which he received in his leg at Vitoria could never be extracted, and was a source of much inconvenience in after life, preventing him from mounting his horse readily and being the occasion of a fall when trying to clamber into a high American waggon whereby three of his ribs were broken.

He was well read, an accomplished linguist, and possessed of the dignity, courtesy, and refined manners of a past generation—qualities which the rush and hurry of modern life have well nigh driven out of existence. Finally he was a good, active and keen soldier—one of those who by zeal, energy, and a high sense of duty and discipline have contributed so largely to the *prestige* of the arm to which he belonged.

CAPILLARY RIPPLES.

BY

PROFESSOR C. V. BOYS, F.R.S.

(A Lecture delivered at the Royal Artillery Institution, Woolwich, 7th November, 1895).

Colonel R. D. Eliott Lockhart, R.A., in the Chair.

The Chairman—Ladies and gentlemen, Colonel Trench, who was to have taken the chair to-night, has, unfortunately, been unable to come, and has asked me to take his place. Some of us had doubts as to what the capillary ripples actually were, but I was talking with a lady from Girton, and she very kindly explained it to me this afternoon; she was quite sure they had something to do with the art of preserving curls and fringes in this damp weather (laughter). We all realise the importance of the subject, and probably it will lead to a very animated discussion, so that I am sure you will be glad that Professor Boys should begin at once (applause).

Professor Boys—Colonel Lockhart, ladies and gentlemen, before I proceed with my lecture, I must begin with some words of apology, explanation and excuse. Apology, for I have put the Institution to a most unintended and enormous amount of trouble, and I fear to some expense, in choosing a subject which requires absolutely for its successful treatment the electric light. I did not doubt for a moment but that the electric current was laid on here, so that it was as easy to turn it on as to turn on the gas; and rather late, and too late in the day to make any change, I was informed that there was no current, but that every means should be taken to supply one. So much for the apology. And now for the explanation. This afternoon, unfortunately, when everything was just on the point of being exactly right we found that everything was exactly wrong owing to a mishap—a copper on which everything depended was fused. The skill of an artificer in the place was sufficient three or four minutes before five o'clock to replace it by an extemporised one; and Professor Greenhill also when he heard of this mishap went off at once in a cab to Charlton where he was successful in bringing back another copper which appeared one and a half minutes after the artificer's copper was finished. And I must now make my excuse: that in consequence of having got the light turned on only just before five o'clock, I have been unable to rehearse any of my experiments or to arrange that the apparatus should be completely

and exactly adjusted in the manner which we all look upon as being necessary in a lecture. Under those circumstances you will, I am sure, excuse any very evident shortcomings either in adjustment or in the time needed for getting the things sufficiently visible for it to be possible for me to show what I mean.

Coming now to my subject, I wish first of all to shortly dwell upon the fact that the surfaces of all liquids behave as though they were elastic; that is to say in the case of water, say, the surface of the water is as though it were a very thin sheet of something like stretched india rubber, and it always tends to shrink up and become smaller. The same is true in the case of mercury, melted metals and oils, and of any liquid whatever. This force with which the surface of a liquid tends to contract, which is ordinarily called surface tension, gives rise to the whole series of capillary phenomena, one of which alone to-day, or at the outside two, I wish to enlarge upon. They are called capillary, not that they have to do directly with hairs or with the curling or otherwise of hair, which has been suggested, but because the phenomena which this elastic surface renders most evident are those which are produced when very fine tubes, as fine as a hair, are made use of.

And now I should like to employ some hairs of an ordinary camel's-hair brush to illustrate this very point. I will show you an old experiment; one which if it were not called an experiment would be recognised as a familiar experience. The brush is projected upon the screen; you see the hairs are distinct, separate and sharply defined. It is dry. It is ordinarily stated that if you dip a brush into water, wet it and shake out the superfluous water, the hairs of the brush are drawn together at the point, because the brush is wet. It is because the brush is wet in a sense, but that is not a sufficient explanation, because if the brush is again put into water it is still wet and being in the water the hairs separate exactly as they did before. It is when the brush is out of the water so that the water on the brush is the outside surface of the water in which this capillary or elastic contractile force exists, it is only then that the hairs are drawn together. (*Illustrating the same by electric light on a screen*). I am only showing that one experiment out of a great number—because time will not admit of more—to illustrate the fact that the surface of a liquid always tends with some considerable force to become smaller than it actually is. To give the figures, if you draw a line on the surface of clean water an inch long then the surface on either side of that line is pulling away from the line with a force equal to the weight of about three grains or a little more, not a very large force. In the case of melted metals it is more; in the case of mercury it is eight or ten times as great; in the case of aluminium it is very great, and so drops of melted aluminium are much larger than corresponding drops of mercury or water. Other materials, such for example, as oils, benzine, bi-sulphide of carbon, and a great number of organic liquids have a much smaller surface tension. I wish now, before I come to deal with one of the influences of this force, to show experimentally, by an exceedingly transient experiment I am afraid, that in the case of aluminium, at any rate, this force is capable of holding together a melted wire for an appreciable time, long enough,

in fact, to make an experiment with a magnet upon it. At first one would say, judging by the common information that is to be found in all books dealing with capillary phenomena, that a liquified wire could not exist for an instant. The fact is that all writers who have dealt with capillary forces, myself among the number, take the greatest pains to show that a cylindrical column of liquid launched into space possesses a form which cannot exist except for a moment. The two photographs that I showed here last year, and I will do so again if I may, illustrate what happens when a liquid cylinder is launched into space; and our good friend the diadema spider has come to our aid to provide an illustration. Here (*exhibiting a slide*) I have a photograph of one of those diadema spiders resting on her web; I took it by about two minutes exposure with limelight. What I want to illustrate is this: that while these radial webs are smooth, and necessarily for the purpose of scaffolding, these other finer webs that go round and round in an irregular spiral are beaded. The next slide (*exhibiting the same*) I took with the microscope of part of that very web, and it shows the exact structure of the web as it exists when you see it magnified. If you watch a spider spinning one of those webs where there is a dark background and a bright sun shining you will see that the circumferential webs when spun are shiny, and in the reflected light you recognise a polished wire; but gradually the shininess vanishes and a frosted appearance takes its place. The extremely viscous liquid with which the line is in effect wetted furnishes, of course, that brilliant reflecting cylinder which we at first see. But the liquid cylinder cannot exist; it is an unstable form, and it breaks up into microscopic beads of an extremely regular pattern alternately large and small, as Plateau, the blind Belgian Physicist, originally showed. Now if you take a wire of aluminium and send an electric current through it so strongly as to melt it, the liquid wire should not be able to exist. I shall in a moment connect the ends of this piece of aluminium wire with the terminal of the battery in the next room which is providing the electric light. Aluminium is a good conductor of heat and electricity, but in spite of that, owing to the enormous current, the wire will rapidly be raised to the melting point. But aluminium of all metals oxidises so violently that it is a most dangerous thing to mix it with materials that contain oxygen because they may produce the most violent explosions. Nevertheless, melted aluminium remains bright in a crucible; it needs no flux; it is spoilt by a flux. The result is that the wire does not necessarily oxidise through and take fire as one would expect. But one would say if it remains a bright metal cylinder, and is absolutely fluid, the form is an unstable form, it will break up into beads in the same way that the spider's web, or rather the liquid upon it, broke up. But there is some oxide, and there is an excessively thin film on the surface, not enough to see, but sufficient to prevent the wire at any part getting thinner than anywhere else; there is enough to prevent the unstable form breaking up, and therefore for a few seconds the wire remains suspended between the posts, white hot and absolutely fluid; and having got this white hot wire absolutely fluid we have for the first time the means of examining feeble magnetic forces in the most

brilliant and striking manner. For instance, the weight of the wire used is so small in comparison with the strength of the electric current sent through it that nothing else can compare with it in this respect. The result is that if you bring an ordinary bar magnet as near as a foot even the magnetic force that would not be sufficient to affect an ordinary suspended wire carrying the current will at once lift the wire up into an arch, or make it twist or move in a most agile and brilliant manner. This experiment was described for the first time in France this year, and was published in the autumn, and when it succeeds it is a most brilliant and beautiful experiment. (*After two failures the experiment succeeded*). (Applause).

One might show a great number of exceedingly striking experiments to illustrate the existence of surface tension, but these two I hope are sufficient to make it evident that a liquid surface is an elastic surface which resists being stretched.

Now let me after this introduction come to the case of ordinary waves at sea. If you take the case, which is only too familiar to many of us, of a great swell on the ocean with waves a quarter of a mile perhaps, or even more, travelling at a speed which no ship can hope to keep pace with, as those waves come along the actual slope of the waves is nothing at all considerable, but they travel at an enormous speed, the larger the wave is the more quickly it travels. Large waves of any fluid, whether quicksilver or water or of anything else, all travel at exactly the same speed, because just in proportion as the amount of matter in the wave is less with the lighter material so is the force due to gravity upon it less, and it is in virtue of the gravitational force that the propagation of the wave is continued. What is the law which connects the wave with the velocity with which it travels? This has been calculated over and over again and there is no difficulty about it, and it has been experimentally observed as much as fifty years ago by Mr. Scott Russell with waves of all sizes, and the law is this: that if you take a wave four times as long as another from crest to crest (I am not speaking of the height of waves, because the height has nothing to do with it) it will travel twice as fast; if it is nine times as long it will travel three times as fast, and so on; and if you want to know the actual speed with which a wave of any size will travel that can be made evident by means of a diagram like the one here upon the wall, which gives upon it a large amount of other information. This is not an ordinary diagram divided up into squares of equal parts, it is a logarithmic chart.[1] In order to find the case of a wave of any wave length it is necessary to move along one of the horizontal lines until the number representing the wave length in inches is reached. Then on travelling up a vertical line until the "velocity line" is reached the corresponding number on the vertical scale gives the velocity in inches a second. Similarly where the frequency line is cut the vertical scale gives the number of waves which pass any point in a second. For gravitational waves these lines are straight and slope up and down respectively at angles whose tangents

[1] For further particulars of the logarithmic chart and of the use of "scale lines" thereon, *see* "Nature," 18th July, 1895.

are $+\frac{1}{2}$ and $-\frac{1}{2}$, *i.e.*, they rise or fall one square for every two squares they advance horizontally. This is one of the advantages of logarithmic plotting, any exponential relation is represented by a straight line whose tangent of slope is equal to the exponent. The slope indicates the law, the exact position gives the numerical relation. Thus the chart shews at once that a gravitational wave 100 inches long travels at about 80 inches a second, or 10,000 inches long at 800 inches a second. Now going down the line of velocities to a wave one inch long we find the velocity of travel to be eight inches a second, and of small waves $\frac{1}{100}$-inch long to be only $\frac{8}{10}$ of an inch a second. Now if the same law of waves which applies to great waves is also true of small waves, then a wave $\frac{1}{10}$ of an inch long should creep along over the surface of the water at a rate of between two and three inches a second. Who ever saw little ripples on the water creeping along stealthily in that way? Our experience tells us at once that there is no such thing, so that when waves are small enough the gravitational law appears absolutely to fail. Now remember that when the surface of the water is put into the wave form it is more extended than it was when it was flat. Under the influence of gravity the higher portions of the water are drawn down because they are above the general level, and the lower portions are pushed up because they are below the general level, and so the wave advances. Again under the influence of capillary force this longer surface tends to become as short as possible; it has been stretched in virtue of the wave form and so the capillary forces tend to pull the upper parts down and to raise the lower parts up, so that under the influence of capillary forces the wave also is able to travel. You have exactly the same result upon the water (whether you consider gravitational forces or capillary forces) except that the law is different. The smaller the wave is the greater the capillary effect; the smaller the wave the less is the gravitational effect. The result is that if you consider gravitational effects alone you get a law illustrated by one straight line, which applies to all liquids whatever; if you consider the capillary effects alone you find that the line representing the velocity slopes the other way, but now a distinction arises between different liquids. Those in which the surface tension with respect to the density is great as in the case of water and especially of fluid aluminium have higher velocities than liquids where the reverse is the case, as with chloroform for instance. In consequence each liquid has its one line representing the velocity of capillary ripples, all of which slope down at the same angle that the gravitational line slopes up. In reality both forces are acting at the same time, and the actual truth is represented by the two straight branches joined by a curve. This is shown for the case of water, and from this it is possible to read by inspection the true velocity of a wave of any size whatever, from millions of miles long on the right to a millionth of an inch on the left. So long as you have two complete squares on each side there is no occasion to carry the diagram longer, because you can multiply by ten and by a hundred as often as you like and so extend the scope of the diagram indefinitely. It is evident from the diagram that gravity has practically no effect in the case of ripples of a size of $\frac{1}{10}$ of an inch or less, and so they are called*

capillary ripples. Now there is a difficulty in seeing ripples like this intentionally made, because all surfaces of liquid owing to tremors have other ripples passing across them; and again they cannot be seen, because taking for instance ripples $\frac{1}{100}$ of an inch long from crest to crest, travelling, according to the diagram, at the rate of about 56 inches a second, about 5600 will pass before the eye every second, so of course the eye cannot follow them. In the case of a longer wave, so many will not pass before the eye in a second, but from the diagram you can at once get particulars of the number of ripples of any size that will pass the eye in a second, or the rate at which they will travel.

Now I am going to deal this evening with ripples from about a tenth long to somewhere about a fiftieth part of an inch, travelling with a velocity of 20, 30 or 40 inches a second. The two difficulties to be overcome are (1) the fact that owing to tremors the surfaces of liquids are generally already covered with ripples, and (2) both these and those intentionally made move so quickly that the eye cannot follow them. Two devices have in consequence been made use of. In the first place, in order to prevent the first difficulty I have suspended a tray of mercury resting on a heavy stand from this gallows by a long loop of india rubber; I take mercury as being more convenient than water, because it does not wet the wood tray, it is mobile, and it reflects the light well. The whole arrangement is so free, it will swing about so that, apparently, it is the last thing to be steady; but the mere fact that it is free to swing in all directions prevents any sharp disturbance from outside from producing these minute tremors which we wish to examine. The second thing is to take care to look at the liquid not continuously but as often as the ripples pass any particular point. Supposing that the ripples, for instance, pass a particular point at the rate of 120 times a second, if you could blink your eyes 120 times a second you would see them stationary. But that is impossible, and instead a blinking machine consisting of a little motor carrying a disc with holes in it is driven round so that the holes let the light through 120 times a second, so that every time a ripple comes to a particular place the hole is open and then the ripple moves on, but it is out of sight until the hole opens again when a new ripple is there, so that you only see the ripples in the same place, and therefore they seem stationary. If, on the other hand, the motor does not keep exact time, as it never will for long, then if it is going a little too fast or a little too slow these ripples will be always just a little bit behind or ahead of their former place, and the effect will be that the ripples will appear to creep along, and though absolutely invisible to continuous vision, will be not only visible but even extraordinarily conspicuous. The machinery is very simple to show this. Here is an electric lantern and a piece of common looking-glass to throw the light on to the mercury, a lens that will focus the surface of the mercury on the screen, and this little motor with a disc to make the light intermittent. The fine rod that you see coming down is a piece of glass fastened with soft wax on to one prong of a tuning-fork, and by means of a screw I can move the fork so as to bring it just in contact with the liquid. If the prong of the fork is touched in the lightest possible way with a gimlet with india rubber on the surface to give the

lightest and softest tap ripples are produced, but you cannot see them, the dust on the surface appears stationary. Now I will ask you to blink your eyes and get, if possible, an instantaneous view of the screen, you will then see that there are circular ripples round that point; but to make them easily observed I will put this motor in the beam of light. The motor is now going, and as soon as the speed is right the ripples will appear perfectly stationary, and so conspicuous that it is difficult to imagine that under ordinary circumstances they are quite invisible (applause).

While the fork is in position I will illustrate the fact that vibrations which are slower make ripples which are larger and which travel more slowly. I am now placing in position another fork which gives a lower note, and you will see that the smaller number of vibrations produces evidently the larger waves.

The next thing I will show is that the two forks are correctly tuned to an octave. As the motor changes its speed the ripples produced by each creep in and creep out together, or are both at rest. Next when they are creeping in or out it must be evident to every one that the little ripples are travelling more quickly than the bigger ones (applause). I shall now take two forks which give exactly the same note. You see the ripples due first to one and then to the other separately; they are the same size and travel at the same speed. But on sounding the two together there is a sort of pattern rather like the back of a watch due to the combined ripples, and the lines of intersection are stationary even though the ripples are moving. If the intersection lines are always in the same place they should be visible by continuous light. I take away the motor and you see stationary ripples of half the wave length due to the interference of the two sets travelling in opposite directions. Those are not the true ripples; they are an interference phenomenon due to the two sets independently travelling (applause). I will next show you a curious thing. If one fork is put out of tune by the addition of a small piece of wax the two sets of ripples still interfere with one another, but the waves produced by the slightly lower fork (that with the added wax) do not travel quite so fast, and so the lines of interference slowly change. The result is that when the forks both sound the interference pattern travels slowly from the sharper to the flatter fork, these interference ripples are visible by continuous light. Similarly with two forks, one giving the octave of the other stationary interference, ripples can be produced as is the case now, or if the interval is imperfect they slowly creep towards the fork that is too low.

I wish next to show by means of a little piece of microscope cover glass cut straight on one side and with a concave curve on the other, that ripples may be used to illustrate the phenomena of optics and acoustics, reflection, diffraction and the "Döppler principle." The glass is floating on the mercury and as soon as it is quiet I hope to be able to show the true reflection from the concave surface and the formation of an image at the focus. I will next use the straight edge. With this the reflection is exactly that which would be produced if there were another identical tuning fork on the other side of the glass. The result is the same inter-

ference that we obtained with two forks is next produced with one. Next if the tray containing the liquid is made to slowly swing like a pendulum, as it now is, then the image of the point which is behind that reflector is moving backwards and forwards also. Now here one set of waves is moving in the same direction as the mercury and the other in the opposite direction, so we have an illustration of Döppler's principle. If a railway engine is approaching the whistle sounds sharp, if it is receding it sounds flat. Now returning to our experiment, when the reflector is approaching the style the image of it, the imaginary style, is approaching also and is, therefore, sharp, and the interference pattern between the two, since one note is sharpened and the other flattened, moves from the sharp to the flat note, and as the mercury moves alternately each way the interference pattern swings backwards and forwards also. I next wish to show that waves go round a corner. Light ordinarily to all intents and purposes casts a perfectly sharp shadow and does not go round a corner. It is not true in reality; light does go round a corner, but this can only be observed under special conditions. All wave action goes round a corner and true sharp shadows are impossible. On placing the piece of glass in the way of the ripples it is, I think, manifest that it does not cast a sharp shadow.

Then it is possible to make plane waves by the simple device of replacing the glass point by means of a glass straight-edge. This is now done, and I shall be able with them to show the formation of a focus far more conspicuously than before.

I have endeavoured this afternoon, but I am afraid with imperfect success, as the result of the difficulties to which I have been subjected, to illustrate experimentally the laws which are due to the formation of ripples by tuning-forks. But there is yet another way of producing these ripples, which is simply to take a tube, to attach a glass style to a piece of skin tied over the end of the tube, and then to set that tube so that the point just touches the surface of the liquid. What I am going to try, and may succeed in showing, is that the ordinary tone of the voice is sufficient to set the air vibrating and with it pieces of paper or skin or anything else; and a fine glass style attached to the skin stretched across the end of the tube will vibrate according to the tone of the voice. If, therefore, it is possible to speak in a tone of voice that corresponds with the note that the motor is giving, then at the time of speaking the vibrations of the voice become perfectly evident; if I speak in a tone exactly corresponding to the motor the rings do not move at all. But if I raise my tone in the slightest degree (*speaking in a slightly higher tone*) the vibrations are faster, and under those circumstances the rings begin rushing out (applause); and, on the other hand, if I lower my voice ever so little (*very slightly dropping his voice*) it is quite enough and they begin rushing in. In fact I cannot help thinking that if this arrangement were neatly and conveniently put up it would form an excellent and clear method of demonstrating whether a person could sing in tune or not; he would simply be told to sing the particular note put before him, and if he could sing it correctly these rings would not move at all; but a minute

error of tone, either sharp or flat, would at once send these rings one way or the other; if they went out he would be sharp; if they went in they would be flat; and, therefore, there is no occasion for judgment. This is more precise than any judgment.

And now, in conclusion, I have only to say that I have been working under considerable difficulties to-day, and I hope that the somewhat lame way in which only I have been able to succeed has not been such as to prevent your having been interested in the matter that I have put before you (loud applause).

DISCUSSION.

Major P. A. MacMahon, R.A., F.R.S.—Notwithstanding what was said by Colonel Lockhart in introducing the lecturer to us I think that considerable difference of opinion existed before the lecture as to the exact nature of the matter that was to be brought before us, but I think now that the lecture is concluded we find ourselves in perfect agreement in regard to the charm of that to which we have listened and to the great experimental ability that has been exhibited before us. I believe that the experiments have been completely successful and this in spite of the difficulties, in no way due to the lecturer, that suddenly presented themselves this afternoon; difficulties that must have proved insurmountable to one less expert and resourceful than Professor Boys.

He has brought before us wave motion, a subject most interesting to us in our profession. Wave motion is the common ground of the physical sciences—chemistry, heat, light and electricity and enters notably into the physics of the science of artillery. He is happily no stranger in the theatre of this Institution and many of us present here this evening must remember his photographs of flying bullets that enabled us to follow the projectile in its flight and to observe the attendant trains of waves with a clearness of vision that had not previously been possible. This, in my view, was great work in gunnery. It is again an auspicious circumstance that Professor Boys has recently become interested in the mode of action of various explosive substances. In the powder chambers of guns we frequently find abnormal pressures arising from wave action in the gases produced by the combustion of the explosive. These pressures constitute one great difficulty in our subject. Very little is known about them. The associated experimental work is of the most refined and delicate character. If those who have the power will keep the attention of Professor Boys riveted upon this matter and take action such as will stimulate his interest and curiosity I feel certain that advantages will accrue to our science that, probably, we could obtain in no other way. He may soon render us further signal service in this direction. Certainly we may assure him that we are hopeful and expectant.

No one could have listened to the lecture without realising the extraordinarily minute character of the materials dealt with and of the phenomena exhibited. We may be sure that the necessary experimental skills varies according to a high negative power of the size of the subject matter. It is most gratifying to know that the lecturer is fully equal to the demands and in the respects mentioned is notoriously unapproachable in this country. Before sitting down I would say that I think we may heartily congratulate ourselves that various artillery problems are gradually coming under the strong hand of Professor Boys.

Professor Greenhill, F.R.S.—I am pleased to have the opportunity, Sir, of expressing the very great pleasure that I have felt in listening to Mr. Boys' lecture.

Mr. Boys has the talent of revealing to us the minute and invisible phenomena of Nature—phenomena hitherto invisible because of the swiftness of their propagation, and by reason of their minute scale. We have had the privilege of seeing his photographs of bullets exhibited in this room, as has already been mentioned by Major MacMahon, showing a bullet in full flight accompanied by waves which have never before been seen or been possible to be seen by the unaided eye—waves such as we see accompanying a ship in its progress. Mr. Boys explained to us his ingenious diagram on the wall by which the wave length is exhibited graphically. I should like to ask Mr. Boys whether he thinks it is possible to interpolate there some curves representing the waves that we see on the surface of ice, because a card of such a nature might prove very useful to a skater finding himself with an inviting stretch of ice in front of him and which this card would enable him to attempt with security or the reverse (applause).

Colonel Watkin, C.B., R.A.—There is one thing, Sir, that I would like to suggest. Professor Boys has already given us three most interesting lectures, and I hope that this will not be the last (applause). We have been taken into the region of minute time and now into the region of minute ripples, and I think that before, in one other lecture, the Professor took us into the region of minute draughts, telling us that in the experiments of which he gave us an account, a draught moving at the rate of one inch a fortnight would have been fatal. It is refreshing to think of such fairy zephyrs suffering as we have been from the recent gales. I trust that when Professor Boys has completed the experiments at the butts on high explosives he will give us the advantage of hearing him again (applause).

REPLY.

Professor Boys—There is no doubt that the logarithmic chart is fully competent to deal with the question raised by Professor Greenhill. I have not myself numerically gone into the question of waves on water coated with ice, but the ice has in consequence of its elasticity some action akin to that produced by the surface tension of water. The thicker the ice is the more it resists the bending; the parts raised tend to move down and the parts bent down tend to rise, so that exactly in the same way ice should tend to hurry on or increase the rate of propagation of the wave. In addition to that the fact that ice weighs somewhat less than water is all to the good, so that there will be a more rapid advance of the waves the thicker the ice is. If, therefore, a skilful skater, when he came to a place where there was beautiful black ice in front of him, had time to see the advancing wave, to measure its wave length and to see how fast it was going, and then to refer to a chart and see whether such velocity corresponded with a thickness that he concluded he could traverse safely, then, of course, such a chart would be of real practical use.

Meanwhile a chart of that sort is exceedingly convenient; a logarithmic chart is, in fact, capable of dealing with all sorts of points of great practical importance—enabling one to take out quantities with a considerable degree of accuracy and over an enormous range. And, moreover, I believe also it is competent to deal with another question which I have not dwelt upon this afternoon, namely, the rate at which waves and ripples die out in passing over liquids of any kind whatever. For instance, a large wave would travel perfectly well on treacle; a wave half a mile long would travel so well on treacle that it would be the same practically to all intents and purposes as a wave on water. On the other hand very minute ripples such as you have seen to-day would not travel an appreciable distance before they were dead, and the more viscous the liquid might be the

more rapidly they would die out. And the same thing is true of all liquids; the smaller the waves the more rapidly they die out. All this is capable of being represented by straight lines on the logarithmic chart as they follow an exponential law, and this is one of the advantages of the logarithmic method of plotting.

There is one other point in connection with ripples that I might mention, I can do it with the help only of the black-board and chalk. The experiment is one which Lord Kelvin has described, and it is one which everyone who goes out in smooth water in a boat is capable of observing for himself. If you are drifting along slowly in a boat and a fishing-line is being drawn through the smooth, reflecting surface of the water, then if you travel at a speed more than the minimum velocity at which a wave can travel in the surface of water, namely, about nine inches a second corresponding to the wave length of about $\frac{7}{10}$-inch, a permanent wave pattern accompanies the line. If, however, you are travelling at a speed which is less than nine inches a second then exactly as a bullet, going less quickly than sound, goes through the air without making any waves, and leaves the air all round it still, so does this fishing-line cutting the surface of the water leave that surface without a ripple upon it, and the reflection from such surface is as perfect as if the fishing-line were not going through it. If you start at a speed considerably greater than nine inches a second, say, three or four feet a second, you will find a series of small ripples, too small almost to be seen, branching out hyperbolically, into a series of waves with which everyone is familiar. The angle being such that the minimum velocity of the wave, divided by the velocity of the boat, is the sine of half the angle; and if you slowly diminish in speed these ripples slowly open out, presenting a perfectly visible and beautiful phenomena. Further, just as they are opening out as nearly as possible into straight bands, *i.e.* just as the boat reaches the minimum velocity of water waves they vanish; it is almost instantaneous, but give the slightest impulse to the boat and they will suddenly come into view again. And this is an interesting thing—I have not tried it in a boat but in the laboratory. When you have a thing moving through water at such a speed the ripples just vanish, if you touch the surface of the water with soap, ox-gall, ether, or with anything that reduces the surface tension to a considerable amount—for instance, with soap the surface tension is reduced to one-third—the minimum velocity of waves on the soapy liquid may still be exceeded by that of the moving point, the ripples flash out again. That is an experiment with which there is no difficulty whatever in succeeding.

I think that the other points which have been touched upon are such that I can hardly answer. I am exceedingly gratified that the trouble which I have taken in presenting this matter to you this afternoon should have been appreciated. I have not succeeded in presenting the experiments in as finished a manner as I should have liked, but I have succeeded in showing you the ripples.

The Chairman—Ladies and gentlemen, it only remains that I should on your behalf thank Professor Boys very heartily for the most interesting lecture that he has given us, and congratulate him on the success of his experiments, which we know have been carried out under great difficulties, and I will express the hope that he will come down again at no very distant period, so that we may have an opportunity of hearing him again.

VERIFYING AT THE MEAN OF THE 100 YARD BRACKET.

BY

CAPTAIN A. ff. POWELL, R.A.

THE object of this paper is to compare the process of finding the range by verifying at the mean of the 100 yd. bracket with the present system of verifying at the mean of the 50 yd. bracket, with the view of showing that by the former the required range is arrived at,

(1) More reliably,
(2) Sooner,
(3) With less expenditure of ammunition.

More reliably because the officer ranging is, *during the process of ranging*, only concerned with alterations of 50 yds., and the results of his observation are thereby simplified and rendered more consistent.

More expeditiously because fewer changes of elevation and fewer ranging rounds are required.

The examples will speak for themselves.

For the sake of simplicity the target is supposed to be at once included in the "long bracket," and the examples compare the process of finding the range by each method, supposing it to be at any intermediate division.

It will be noticed that where the range is at 25 or 75 yds. the number of rounds expended and the number of changes of elevation is the same, but it is contended that if the true range is at 25 the chances of getting three —'s at 00 and three +'s at 50 are greater than getting two +'s and two —'s at 25, *i.e.*, to say the range is more reliably obtained and with less chance of confusion to the officer ranging.

The chances however are slightly in favour of the range being at some other sub-division, and in any of these a saving in ammunition and changes of elevation takes place in favour of the long bracket.

I have, of course, been obliged to suppose the guns to shoot exactly the same in each case.

REQUIRED RANGE
2025

100 yd. Bracket.	50 yd. Bracket.
2000 1— 7—8— 25 50 4+5+6+ 75 2100 3+ 25 50 75 2200 2+	1— 5—6+7—8+ 4+ 3+ 2+
No. of rounds 8 Changes of *E* 5	No. of rounds 8 Changes of *E* 5

Remarks.—Where, as in the 2·5″, the shrapnel ranges from 25–50 yds. further than the ring the lower elevation can be taken as the range, thus necessitating only four changes of elevation.

REQUIRED RANGE
2050

100 yd. Bracket.	50 yd. Bracket.
2000 1— 25 50 4+5—6+7— 75 2100 5+ 25 50 75 2200 2+	1— 5—6—7— 4+ 3—9+10— 3+ 2+
No. of rounds 7 Changes of *E* 4	No. of rounds 10 Changes of *E* 6

REQUIRED RANGE
2075

Same as 2025.

REQUIRED RANGE
2100

100 yd. Bracket.	50 yd. Bracket.
2000 1—	1—
25	
50 4—5—6—	4— 5—6— 7—
75	
2100 3+ 7—8+9—	3+ 8—9+10—
25	
50	
75	
2200 2+	2+
No. of rounds 9	No. of rounds 10
Changes of *E* 5	Changes of *E* 6

The remaining ranges up to 2400 are merely a repetition of the above.

TWO AUTHORITIES ON "THE EASTERN QUESTION."

BY

GENERAL SIR COLLINGWOOD DICKSON, V.C., K.C.B., R.A.

AND

GENERAL W. H. ASKWITH, R.A.

THE following notes on two Artillerymen who served with distinction in Turkey and Persia earlier in this century will be appreciated now that "The Eastern Question" is once more at issue.

GENERAL SIR W. FENWICK WILLIAMS OF KARS.

The subject of this memorandum was born at Halifax, N.S. in December 1800, being the second son of Thomas Williams, Esq., Commissary-General and Barrack-Master at Halifax, N.S. (The dates of his entry into the Royal Artillery and of his various promotions to rank in the Regiment are given in the List of Officers of the Royal Artillery, published by the R.A. Institution (1891), and in Kane's original Lists of the same).

The early services of this most distinguished officer as a Lieutenant were first at Gibraltar from July 1825 to November 1827, then in Ceylon from January 1828 to November 1839, and during the period of his service in Ceylon he was A.D.C. for a time to Sir Wilmot Horton, the Governor, and was also acting Surveyor-General in Ceylon, under Sir Wilmot Horton. In August 1840 he became a 2nd Captain and served at Woolwich in a Field Battery until January 1841, when he was selected by the Government (Lord Palmerston, Secretary for Foreign Affairs) to proceed to Turkey with a small party of one Subaltern and 3 Non-Commissioned Officers, R.A. and a Laboratory Artificer for the purpose of instructing the Turkish Artillery and improving their Artillery *matériel* and manufacturing establishments of the Turkish Ordnance Departments, and he was attached to the British Embassy at Constantinople under Lord Ponsonby, the then Ambassador. He arrived at Constantinople with his party in March 1841.

The ability displayed by him in the performance of his important duties attracted the favourable notice of Sir Stratford Canning, who had succeeded Lord Ponsonby as Ambassador, and when disputes arose between Turkey and Persia on the subject of their Frontier Boundaries, which appeared likely to culminate in a war between the

two countries, the British and Russian Governments intervened and offered their good offices towards making an amicable settlement of the questions in dispute. The four Powers (Russia, Great Britain, Turkey, and Persia) appointed Commissioners who were to confer at Erzeroum, and come to an agreement for the proper delimitation of the Frontiers of Turkey and Persia. Williams, then Captain, was selected by Sir S. Canning for the post of British Commissioner, and he was granted the local rank of Major. He proceeded on this duty in December 1843, and was employed on it until 1847; in 1846, he was made a Brevet-Major for his services; and in 1848, he returned to Constantinople and proceeded to the Persian Frontiers with the other Commissioners above named, and was occupied on the survey and mapping out of the line of Frontier between the two countries; in March 1848, his services were further recognized by the brevet rank of Lieut.-Colonel; he finally quitted Constantinople and returned to England in 1853; and in 1852, he was made a civil C.B.

In July 1854, he was appointed Military Commissioner to the Turkish Armies in Asia; the rest of his military career is given in the account of distinguished officers of R.A. in the R.A. Institution (Kane's) List of Officers, R.A.

N.B.—Williams, for his services at Kars, was created by the Sultan a *Mushir* (Field Marshal of the Turkish Army).—*C.D.*

GENERAL SIR FRANCIS R. CHESNEY.

Robert Chesney disposed of his farm at Dunclug, County Antrim in 1772, and emigrated with his wife and family (three sons and four daughters) and settled at Packolet, on the Sandy River, South Carolina,[1] where others, relatives and friends, had preceded them.

A cabin was built and land cleared, but their peaceful and industrious life was soon interrupted in 1775 by the War of Independence.

Under the able guidance of Chesney and his eldest son Alexander (then a youth), the loyal subjects of His Majesty were enrolled under a Proclamation of the Governor, Sir Henry Clinton, for the defence of their country; but they were defeated, and, after various encounters, the whole province was overrun, and the inhabitants reduced to a state of starvation. During the cruel war which succeeded, Alexander became a Captain of Volunteers in the Royal Army. Many acts of bravery and daring are recorded; he was made prisoner four times, but contrived to escape, and was lastly exchanged for an officer of the Rebel Army; he rendered great service to Colonel Tarlton, Sir Henry Clinton, and particularly to Lord Rawdon, afterwards Earl of Moira. At the conclusion of the war, Captain Alexander's property was confiscated, and he returned to England in 1782, broken in health, and a ruined man. Through the interest of the Earl of Moira, he obtained the appointment of Coast-Officer at Waterford, and shortly after of Coast-Master at Annalong, Mourne—N.E. Coast of Ireland—a stronghold of a notorious

[1] *See* "A Carolina Loyalist" in Military Biographies, by Colonel C. C. Chesney, R.E.

band of smugglers. He had previously married again, Jane Wilson, daughter of William Wilson, a tenant covenanter of Westland, Argyleshire, who had been present at the Siege of Carrickfergus and the landing of William the Third.

Nine children were born of this marriage, *Francis Rawdon* being the 4th and eldest son—born 16th March, *1789*.

The family life at Mourne was hardy, and Francis was early accustomed to attend his father in watching smugglers, protecting wrecks, and saving the lives of crews and passengers, and was brought into collision with lawless neighbours. In addition to home instruction he attended a small day school. The father's discipline was severe and he did not spare the rod. Francis began at an early age to keep a Diary, which he continued to the end of his life. In *1798*, he was enrolled as a Sub-Lieutenant in his father's Corps of Militia, and thus early became acquainted with the rough life of a soldier.

Through the Earl of Moira's interest a nomination for a Cadetship at Woolwich was obtained. Interesting accounts are given of his school life, his preparation for the preliminary examination, and the short time passed at Marlow and at Woolwich before obtaining his Commission, in November *1804*; of the life of the young officer at Portsmouth and at Guernsey (where he was quartered for six years); of his romantic attachment to Miss Fraser; his hope and expectation of being employed on service (disappointed by the news of the battle of Waterloo); of his travels in Belgium, Holland, and Paris. He was quartered at Woolwich and at Dublin, married Miss G. Forster, and sailed for Gibraltar in May *1822*. There his wife died in January *1825*, and he returned to England in April. In *1827* and 1829, he visited the battle-fields of Napoleon in Italy and Germany, chiefly on foot, with his two favourite dogs. He refers in his Diary to his disappointment as to obtaining leave to join the Turkish Army in Bulgaria, and when leave was granted, the Russians had dictated terms of peace to the Sultan at Adrianople.

He visited Schumla, Varna, and the course of the Danube; but did not publish his views of the Russo-Turkish campaigns till 1854, when the Crimean War commenced.

In April *1830*, he was Commissioned by Sir Robert Gordon to report upon the condition of Syria and Egypt, and the resources of the country.

His mind was at this time intently occupied with the subject of an improved communication with India, by the Euphrates; leaving Cairo he arrived at Suez in company with Count Chorensky, a phlegmatic companion, who deplored his energy. Meeting Mr. Robinson, the well-known Eastern traveller at Jerusalem, they visited the most interesting parts of Syria; were made prisoners in the desert; escaped, and were retaken and robbed of all they possessed. Chesney attempted to explore the Upper Euphrates; visited Bagdad, Shurstoo, Bombay, and the course of the Indus to Afghanistan, and returned home in September.

In *1832–34*, Colonel Chesney reported to the Government the practicability of opening a route to India by the Euphrates, which, at the time, attracted much attention. The King (William IV.) was greatly interested, and granted him an interview.

The Government decided to send an Expedition under Colonel Chesney's command. £20,000 was voted by Parliament, £5,000 by the India Board.

1834–36, second audience of the King; actively employed making preparations and building steamers; appointment of Robert Cockburn, Lieutenant, R.A. and C. Staunton, Surgeon, R.A.

Great difficulties were overcome; landing and transporting steamers and stores overland to the river.

The steamer Tigris lost in a hurricane; Lieutenant Cockburn drowned, 21st May, *1836;* Colonel Chesney proved that the Euphrates was navigable, and that this was the then known shortest way to India, and he considered that a profitable commerce could be established on the banks; Chesney's bravery and indomitable perseverance were remarkable, and his survey of the river and of the Red Sea convinced M. de Lesseps that the Suez Canal could be constructed, and when he introduced General Chesney to the Council at Paris, he said—

"Messieurs, je presente l'homme à qui nous devons le Canal de Suez, M. le General Chesney, le Pére du Canal."—W.H.A.

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OKEHAMPTON, 1895, AND THE PROGRESS THERE IN RECENT YEARS.

BY

CAPTAIN J. HEADLAM, R.A.

(A Lecture delivered at the Royal Artillery Institution, Woolwich, 7th October, 1895).

COLONEL R. D. E. LOCKHART,
COLONEL-ON-THE-STAFF COMMANDING ROYAL HORSE AND FIELD ARTILLERY WOOLWICH
IN THE CHAIR.

SYNOPSIS:

PART I. OKEHAMPTON, 1895.

STATISTICS.—Training *for service* the object of the practice.
MAIN FEATURES OF THE YEAR'S PRACTICE.
- Advance towards service conditions.
- Rigid adherence to regulation methods.
- Increased use of surprise and moving targets.

POINTS MOST OFTEN NOTICED IN COMMANDANT'S CRITICISMS.
- Want of due estimation of the tactical situation.
- Time taken before a battery in action could move.
- Slackening of fire discipline where most required.
- Defective ammunition supply.

FIELD FIRING.
PRESENCE OF OFFICERS FROM INDIA.

PART II. REVIEW OF PROGRESS FROM 1888 TO 1895.

REASONS FOR CHOICE OF PERIOD. PROGRESS SHOWN BY CONSIDERATION OF :—
- The state of training of batteries on arrival.
- Elementary Practice.
- Battery Service Practice.
- Brigade Division Practice.
- Competitive Practice.
- Organization.

THE CHAIRMAN—Gentlemen, I will ask Captain Headlam to give us his lecture.

CAPTAIN HEADLAM—Colonel Lockhart and gentlemen :—Speaking here last year, Major Hughes drew attention to the growing difficulties of the Okehampton lecture. We must all, of course, rejoice at the absence of those changes which formally filled so many pages of each year's Instructions for Practice, but I hope you will remember that with no departures from well known methods to chronicle the lecturer's task is a difficult one. Fortunately for me General Chapman, at the Royal United Service Institution this spring, threw out the suggestion that "a comparison between the state of things some few years back and what we have now" would be interesting. I decided to attempt such a comparison, and, in consequence, I have divided my lecture to-day into two parts.

In the *first* I shall endeavour to put before you the salient features of this year's practice, in the *second* I shall attempt a necessarily brief review of the progress made in recent years.

PART I.

It has for many years been the custom to give here the statistics of the year's practice ; I have therefore made out a small table giving the

main results, as far as I can obtain them, since the year 1889 when the system of tabulating times and results was started by Colonel Murdoch.

Year.	Time from "Action" to :—				Rate of fire in rounds per min.		Range.	No. of rounds.		Effect.					Percentage of target destroyed per minute in action.
	1st gun.	1st time shell.	Ordinary fire.	End of series.	Total.	Ordinary fire.		Percussion.	Time.	Hits.	Men.	No. of dummies fired at.	Hits per shell.	Men hit per shell.	
	min. sec.	min. sec.	min. sec.	min. sec.											
1889	...	...	...	17 10	1·2	...	2230	7·5	13	63·4	17·0	46	3·1	·8	2·47
1890	...	...	...	12 11	1·7	...	2320	7·8	13·1	43·7	17·7	49	2·0	·8	3·0
1891	...	...	...	11 57	2·1	...	2330	7·1	18·6	48	18·0	43·6	1·5	·7	3·4
1892	59	3 57	7 38	8 3	2·5	4·0	2280	6·3	14·7	48·2	19·0	61·2	2·4	·9	3·9
1893	1 0	3 54	5 32	7 57	2·6	4·0	1940	6·6	14·6	89·2	29·2	72·5	4·2	1·4	5·0
1894	1 10	4 17	5 53	8 43	2·6	4·5	1910	7·2	15·0	42·0	17·2	52·2	1·8	·8	3·8
1895	1 2	4 19	6 28	9 24	2·6	3·5	1890	6·9	16·4	52·5	18·2	43·0	2·3	·8	4·3

There can be no doubt that this careful record has been of the greatest benefit. It has given us a large number of averages which enable us to arrive at some very distinct conclusions; such as, for instance, the time a battery may fairly be expected to take between coming into action and opening fire; the time that will elapse before we can expect much effect from its fire; and so forth—which must be of great practical use, not only to ourselves, but to officers of the other arms. These records also afford valuable *assistance* to comparison between batteries *practising at the same camp.* When, for instance, the general rate of fire is three and a half rounds a minute, and that of a particular battery is only two and a half we may safely say that the firing of that battery was slow and the Commander has a distinct point to which he can direct his attention during the training period. But, gentlemen, valuable as, no doubt, these statistics are, there is a very real danger of paying too much attention to them. If comparisons are attempted between different practice grounds or between different years we shall arrive at most fallacious conclusions. But if it were only that the results of such comparison would be fallacious little harm would, *comparatively speaking,* be done; it is because such comparison is in itself very liable to lead to positive harm that I wish to draw attention to it here. Commandants naturally like their batteries to do well, and the feeling that such a comparison will be made is liable to restrict attempts to render the practice more diverse or targets more difficult. We can take just pride in the fact that our practice is conducted on a far closer approach to service conditions than that of the other arms. Let us never forget that training for service is the be-all and end-all of peace shooting, and let us never sacrifice the smallest fraction of that practical training for the empty honour of a paper percentage.

MAIN FEATURES OF THE YEAR'S PRACTICE.

To turn now especially to this year's practice, I think the main features may be summed up as being:—

A decided advance towards service conditions.

A rigid adherence to regulation methods.

A considerably increased use of surprise and moving targets.

Advance towards Service Conditions.

For some years past we have had tactical schemes, but batteries have known the targets they would have to fire at, and the time or the rounds to fire at each, and *have arranged accordingly.* That is scarcely service conditions. This year for all service practice a "general idea" was issued the night before giving such information as might fairly be forthcoming on service, but no more. Arrived at the rendezvous Commanding Officers received orders, as no doubt would happen on service, as to *what they had to do;* the method of doing it being left entirely to themselves. A battery opening fire did not know whether that fire was to be continued for fifty rounds, or whether a change of target or position would not occur before even ranging was completed. Criticism was directed not only to the way in which the fire of the

Battery or Brigade Division was administered, but also as to whether the Commanding Officer handled his force in accordance with the tactical conditions. In fact as far as possible the training was directed to "employment and conduct of artillery in the field" as well as to "gunnery."

Adherence to Regulation Methods.

A strict adherence to regulations is of more importance than it is sometimes considered. There may be, for instance, better ways of ranging a battery than that which is in our drill-book, though it must be remembered that the drill-book is the result of the collective experience of many years. If there were no such thing as casualties there would be, *comparatively speaking*, little harm in each Commander elaborating a system for himself. But, unfortunately, we are all mortal. What could be more disastrous on service than the sudden accession to command of a Major with a "system" totally different from that in which the battery had been drilled?

For service purposes I think it is impossible to exaggerate the importance of a rigid adherence to the drill-book, and I am rejoiced to find that I can quote no less an authority than our own new Commander-in-Chief in support of these views. Writing recently on this very subject, he said: "The Regulations in this matter cannot be too rigidly adhered to."

Surprise and Moving Targets.

The question of targets is one that so vitally affects the practice as a training for service, and the progress made in this respect has been so decided that I shall devote some time to their consideration.

Surprise Targets.

Taking first the surprise targets, the improvement this year is in the greater number used, and in the greater variety in their positions. It is hardly necessary to point out that a surprise target, the position of which is known, loses a great part, though not all, of its value. I hope by next year there will be many more splinter-proofs, so that the number of surprise targets may be very greatly increased. The excellent practice they give in changes of target is universally acknowledged. Used (as I think General Tyler first used them) to represent a sudden attack on a battery on the move, their value can scarcely be overestimated. The excitement and confusion that frequently occurred showed plainly the necessity of training for such emergencies.

Adverse criticism from outside, though not pleasant, is sometime wholesome, and I will therefore read what one of the senior officers who were present says of the effect of such a target: "The sudden appearance of infantry demoralises artillery!"

Moving Targets.

The moving targets were the new tramway target on No. 3 range, an infantry target on No. 2 range, and a cavalry target on No. 1. The greater number available allowed of their being in all cases part of the tactical scheme. There was no special day devoted to "the moving

target"—in fact I think one formed part of each day's service practice. I will say something of each in the order in which I have just mentioned them.

The tramway is half a mile long, on the switch-back principle, and is most ingeniously designed so that the targets should move at walk, trot or gallop as desired. Unfortunately with a wind against it (as was almost invariably the case this year) the gradient is not steep enough, and so we could only manage to get the complete run by substituting small flags for the figure targets and by sending them at full speed. We had hoped to have five full-sized cavalry figures on each truck, 60 in all; as it was, a few flags rushing diagonally across the front at 20 miles an hour was scarcely a fair target. I trust this will be put right before next season, for it is of the utmost importance that batteries should know, *what they cannot know now*, how to deal with cavalry moving at the trot or canter at ranges between, say 1200 and 2000 yards.

The other moving targets were all on the principle brought in by General Richardson—five cavalry or seven infantry figures on a barrel. The infantry targets were moved two abreast, a great improvement over a single one. Another novelty in their arrangement was that surprise targets were placed in line with them on to which fire was first turned. After a few minutes the moving portion of the line advanced, and the sections represented by surprise targets were turned off; the idea being to represent a line of infantry doing what infantry officers say they would always do—move as soon as our fire became effective.

As regards the system of firing against these targets there has been a feeling for some time that the service system was not perfect, and last year this feeling found expression in the reports of the Commandants both at Okehampton and Glenbeigh. It was suggested that ordinary fire with some slight modifications might be made available against an advancing or retiring target; so doing away with the special "ranging section" system, and having but one for all occasions. The idea was immediately taken up, and 300 rounds were specially allowed for the purpose of experiment at Shoeburyness, where far greater facilities exist for working moving targets than anywhere else. As this is a matter of such great interest, I will briefly describe how the experiment was carried out.

Two batteries were formed out of the officers and non-commissioned officers of the long course, and trained, one to the service system, and one to that proposed. The two batteries then shot against each other, all arrangements for targets, ranges, etc. being made independently of the Battery Commanders, who were kept in complete ignorance. The two systems were tried alternately on identical targets. The targets were large and the advances long—as much as 1000 yards—and covered all ranges between 2500 and 700 yards. The pace was varied and halts were made, (as no doubt would occur on service) at uncertain intervals without any warning being given. Before the practice there was, I think, a very strong leaning to the new system, but when it was over, the opinion was unanimous that the service

system was the best. It was far easier to work, more rounds were fired, and they were more effective; its advantages being especially apparent when the advance of the target was irregular.

There are no doubt some defects in the service system; the orders, for instance, are absurdly long and complicated, and it is not well described in Field Artillery Drill; but both these will be remedied this winter, and I feel sure that if Battery Commanders will drill at it, they will find that it is not difficult to work, and that it is very effective. Of course where the difficulty comes in at practice camps is that there has usually been a ridiculous little target with a very short run; in consequence of the small size of the target the unreal factor of accuracy of direction came in; the laying was slow and ranging rounds unobserved. The short run was in consequence over before any effect was produced, and everybody went away disgusted with the system.

Having given you adverse criticism of infantry officers on our behaviour with surprise targets, let me quote what one of them says about the moving target:—"The chief point was the wonderfully accurate practice made by the guns on a moving infantry target; so good was it, and so systematic in the way of working that it gave one pause as to the feasibility of a frontal attack of infantry on guns at all." With an increase in this nature of practice, the results next year should be better still.

The improvements in the arrangement of the cavalry target were that it was quite invisible from the battery until it started, and the pace was much quicker than in previous years. It was certainly, I think, as quick as cavalry would move on service, though not possibly equal to that of a certain distinguished regiment of light cavalry, one of whose officers attended some artillery practice this year, and wrote in his report: "The time taken by cavalry advancing over 1000 yards up to the guns would be under one minute." That is at a rate of over 34 miles an hour! or, to put it another way, just three or four seconds quicker per mile than the best "Derby" record.

Before leaving the subject of moving targets, I wish to draw attention as strongly as I can to the fact that in order to make this practice really valuable, the targets should not be only on one or two well known runs where they are expected, but that batteries at service practice should *never* know when they will be turned on to a moving target, or when the target they are firing at will begin to move; and also to the fact that to give valuable practice these targets must have a broad front. We should not on service waste the fire of a battery on half a dozen men, whether infantry or cavalry; and it is not sound to say that practice at a small target is good training for shooting at a large one. It is *not*; for it teaches wrong lessons. Accurate direction is almost forced upon the layers; the fire is in consequence slow, and all ranks feel want of confidence in their power to efficiently resist such an attack.

The ground at Okehampton allows of a far greater development in these directions next year, if only the targets and the stores for working them are allowed. The targets themselves are excellent; all we want is more of them.

POINTS MOST OFTEN NOTICED IN COMMANDANT'S CRITICISMS.

It may seem presumptuous in me to speak of faults committed, but I hope you will all understand that I am not airing my own views, but am only putting before you the points of general importance most frequently remarked upon in the Commandant's criticisms. The objects of this lecture must be borne in mind—they are, I take it, twofold. First, to give an opportunity for all officers interested in the subject to meet and discuss in a friendly way the various points that arise in connection with the year's practice, while it is fresh in all minds, and before the changes, if any, for the next year have been settled. Secondly, to give officers serving abroad, who would not see the Annual Report of the School of Gunnery, an opportunity of learning, through the Institution "Proceedings," what is being done at home. Of the utility of the latter I can speak from personal experience while in India.

In drawing attention to the points criticised, I shall endeavour to provide you with many pegs on which to hang discussion.

Want of Due Estimation of the Tactical Situation.

The fault of the season undoubtedly was *want of due estimation of the tactical situation*; and this was shown in many ways, which I have grouped under the following heads:

Choice of position and method of occupying it.
Formations adopted.
Reconnaissance.
Ranging.
Choice of sights.

Choice and Occupation of Position.

Positions were not unfrequently chosen without reference to the work to be done. The most common fault of all was to take up a position with reference only to the individual target first engaged. A Brigade Division supporting an infantry attack had to advance about 100 yards in order to bring fire to bear on the point of attack; and a battery ordered to resist the enemy's advance down a certain valley came into action where only the high ground at the end of the valley where the column first appeared was visible, so that unless the enemy stopped at the first round a change of position was inevitable. Command of all ground on which fire would be likely to be required would appear to be a first essential for a good artillery position; and it is mainly because this condition cannot be attained from under cover that I cannot believe in the use of such positions except on very rare occasions on service; putting altogether aside the demoralising results of training men to hide behind hills.

There were far fewer cases of the misuse of the "deliberate" than have had to be spoken of in previous years, and that I have no doubt

is in a great measure due to the discussion in this room last year; but there were several cases of batteries being halted in a "covered position" which was *not under cover*, and more where, though the battery was concealed when halted in this position, the approach to it had been in full view of the enemy. The deliberate method was also occasionally used when it was *tactically* wrong. For instance, an advanced guard battery ordered to brush aside advanced parties, and specially warned not to delay the main body, used the deliberate method, but the drill-book says of such action "As the essence of success in this case is to prevent the enemy from gaining time the artillery must be prepared to commence action at once at a decisive range."

Formations.

The formations adopted occasionally showed that the rules on this point in Chapter IV. Field Artillery Drill under "Employment and conduct of Artillery in the Field" had not been sufficiently studied. The intervals were frequently at fault, and in one case the lesson was brought home. The first two batteries of a Brigade Division to come into action took between them 65 yards more than their proper front with the result that the third battery was absolutely crowded out. With large forces this tendency to spread beyond limits would be very serious and might greatly interfere with the combined action of all arms.

To take another instance. In emerging from a defile under fire batteries frequently formed line directly to the front instead of immediately clearing away to a flank—probably with disastrous results to the batteries following them.

Again, surely when in pursuit of broken troops batteries should be pushed into action as rapidly as possible without waiting for a simultaneous advance of the Brigade Division.

Reconnaissance.

In 1893 Major Hughes drew attention to the dislike of Brigade Division and Battery Commanders to leave their commands and advance well ahead to reconnoitre. On the part of Brigade Division Commanders this has practically disappeared, but Majors for the most part still show great reluctance to leave their batteries. It is not only important that the Battery Commander should be accustomed to leave his battery, but that the subalterns should be accustomed to being left. This was shown where the battery was attacked in the absence of the Major, and here again I will quote a looker-on of another arm: "The subaltern officers showed the same inevitable want of confidence I have seen in young officers in other branches." We can scarcely wonder at it if they never get a chance.

Ranging.

The system of ranging is now generally understood and acted on throughout, but it is apt to be made a cast-iron rule and the modifications which the tactical situation demands, *and which the drill-book allows*, are often neglected. A column of fours is surely an excellent instance of a case "where it is desired to take advantage

of the enemy being in a disadvantageous formation," but there were few who attempted to do so. Then, again, there were several targets at very short ranges, but the necessity for rapidity was often forgotten, and it was not uncommon to find the ranging carried out as elaborately as at long ranges. On the other hand, at these short ranges cases occurred where the rounds of percussion shrapnel in the guns were wasted without establishing any bracket and in consequence the whole of the time shrapnel was ineffective. Against the cavalry target also the method was not suited to the occasion. This cavalry target was I admit very difficult as it appeared suddenly out of a ravine only about 600 yards in front of the guns; but batteries have been surprised by cavalry before, and I think our cavalry friends have not given up the hope of doing it again. I feel sure that with practice we should stop cavalry in that distance. This year I am afraid they would in most cases have "got in." Commanders did not seem to appreciate the fact that magazine fire—excellent as it is between 500 and 1000 yards—is useless within 500 yards, and did not give "case" until far too late. I sincerely trust that more practice with case against moving targets may be introduced. Not only is it as a rule fired very slowly, but on every occasion on which I have seen it used there has been the same disinclination to commence it soon enough.

Choice of Sights.

It may seem absurd to say that the choice between telescopic and tangent sight is a tactical matter; *but it is.* It may be, for instance, a very good thing to use a Scott's sight against a small object like a column regarded purely as a target; but that advantage may be quite overwhelmed by the fact that that column will probably move as soon as you begin to fire at it, and that Scott's sight is quite unsuitable for use at a moving target. I hope in the new edition of the drill-book some simple instructions may be given as to the occasion on which Scott's sights may be advantageously used on service. It is a question which has hardly been noticed before and the reason is not far to seek. Moving targets have been outside the ordinary scope of the practice and special days have been devoted to them.

So far for mistakes due to tactical misconception; the other points to which I should like to draw your attention are—

The time taken before a battery in action could move.

The slackening of fire discipline where most required.

The ammunition supply.

TIME TAKEN BEFORE A BATTERY IN ACTION COULD MOVE.

There is no doubt that many batteries find a great difficulty in "getting away" if suddenly ordered to move. The following are, I think, the causes:—

From want of practice No. 6 either does not fuze shell quick enough so that at "cease firing" he finds himself with none ready

and starts *then* to fuze them; or through over-keenness he prepares too many and finds himself with a lot which will not go into a portable magazine and have to be unfuzed before they can be put back in the limber.

Through Battery Commanders not giving correct orders confusion arises as to whether guns have to be loaded or not. Frequently the order "cease firing" was given by itself, and then just as guns were ready to be limbered up the order "Percussion shrapnel, load."

Through old habits of having a sort of "free and easy" after the end of each series, directly encouraged as it was by the competitive regulations last year. The "replace ammunition" after the last series is also, I think, to blame, and I should like to see it relegated to the gun-park on return to camp. Next year the *times* from "last gun" to "march" are to be recorded, and once drawn attention to no doubt this delay will soon disappear. I can imagine the state of mind of a general who had sent in a hurry for a battery and found it took five minutes to pack up before moving.

Slackening of Fire Discipline.

In many batteries there was a slackening of fire discipline at Brigade Division practice and also when surprised. I do not think the fault lay in the discipline itself. In nine cases out of ten it was due to giving *casual directions* instead of *explicit orders*. Unfortunately this tendency becomes most marked in moments when clearness is of greatest importance. Over and over again hesitation and uncertainty were directly caused by the neglect of the *orders* which everybody knows, and on which everybody would have acted. We all know the uncomfortable feeling aroused by not knowing what our immediate superior is driving at. I fancy that for service purposes it is of the utmost importance to avoid this, and it can only be avoided by rigid adherence to the familiar orders of the drill-book.

Ammunition Supply.

When batteries have no opportunity of drilling with wagons until they come to practice, it is, of course, extremely difficult for Captains and Quarter-Master-Sergeants to carry out their most important duties successfully. No doubt the ammunition supply was a weak point. The Captains and Acting-Captains did not, if I may say so, seem to grasp the fact that there was really plenty for them to do. To give an instance—it was "limber supply" and the ammunition was running short; the Captain might have brought up a wagon or two, but he did nothing and the numbers from the guns were running backwards and forwards independently to the wagons 200 or 300 yards in rear, passing the Captain and the Quarter-Master-Sergeant who sat quietly looking on. Do you think on service we could allow any gunner who felt inclined to double off to the rear to look for ammunition? Again, I have seen the limbers go away under the impression of wagon supply, and when for some reason the wagons were delayed the limbers left formed up 300 to 400 yards in rear and the guns seven or eight minutes with no ammunition except what was in their portable magazines, when it would have been easy for the Captain to send the limbers up again. And that brings me to a point I wish to bring forward. Are we wise

in making the question of limber or wagon supply depend on the Battery Commander's order going into action; surely the limbers should never leave the guns until it is quite certain that the wagons are at hand. How is the Major leading his battery into action to know that the wagon teams are jibbing on a hill half a mile in rear? Again when the limbers do go to the rear are we wise to let them trot? The trot often becomes a gallop in peace—what will it do in war? Imagine all the limbers of a Brigade Division galloping off to the rear: when are they going to stop, and what effect will their appearance have on the other arms?

Gentlemen, I have done fault-finding. I hope that none who may think they recognise particular occasions will bear malice. I have only instanced faults of frequent occurrence, and I think it is greatly because we have as a body resolutely looked faults in the face that we can boast such splendid progress.

FIELD FIRING.

Before I proceed to Part II., I want to mention two other matters. The first is long range infantry fire. It is of vast importance to us to know what precautions we must take against this fire. I am inclined to think that the generel idea among Field Artillery officers is that we may pratically neglect it over 1000 yards. Some infantrymen, on the other hand, claim great effect against batteries up to a much longer range—which is right? It can only be found out by actual trial, and such trial should not be deferred until war. The field firing at Okehampton has unfortunately been given up, but experiments have taken place to a small extent at Glenbeigh. The results of those there last year—which were given here by Colonel Marshall—certainly favour the gunner's view. I hope Major Paterson will tell us something about what took place there this year. But we want more of such experiments under the nearest possible approach to service conditions. Colonel Walford in his lecture here in 1888 said we, as gunners, should be judged by the *effect of our fire*. I think we may fairly say that on this point we gunners will form our own judgment according to the effect of the infantry fire. Our practice camps are thrown open to infantry officers, and every course has a battery with 120 rounds of ammunition placed at their disposal for any experiment they may care to make. Cannot we combine and have, say, a battalion at Okehampton for a fortnight? It is of equal importance to both arms. If the infantry can cause us heavy losses at 1500 yards we must arrange our formations accordingly. If they cannot surely it is just as important that they should know it and not waste their ammunition at such ranges.

OFFICERS FROM INDIA.

I should also particularly like to draw attention to the number of Field Artillery Officers from India who visited the camp this summer —from the Inspector-General downwards—a happy augury I hope for a closer connection between those who happen to be serving in India and those who happen to be at home. Old jealousies die hard—we both enjoy particular advantages, we both labour under peculiar dis-

advantages. Surely, with a little give and take, it should be possible to make the drill-book the universal authority, so that we might all feel, that called on to serve wherever it might be, we were safe in pinning our faith to that. If I may be allowed to say so, I should much like to see an officer representing India at the annual conference at Shoeburyness.

PART II.

REVIEW OF PROGRESS FROM 1888 TO 1895.

To attempt a review of the progress at Okehampton in recent years it was necessary to fix a definite period, and I have chosen the year 1888 for my starting point for the following reasons :—

After the practice that year, Colonel Walford delivered a lecture in this theatre on "Service Practice" which proved the commencement of this series.

1888 was the first year in which the batteries at Okehampton were practically all armed with the 12-pr., as I hope this will be the last.

And lastly, I had the advantage of personal recollection, having been myself on the Staff at Okehampton in 1888 and 1889.

I shall endeavour to take you with me through the main features of each year's practices, the time at my disposal makes it impossible to go into details. For convenience of comparison I shall make this review under the following heads :—

State of training of batteries on arrival.
Elementary practice.
Battery service practice.
Brigade division practice.
Competitive practice.
Organization.

State of Training of Batteries on Arrival.

Let us begin with the training of the batteries before they arrived at the practice ground. The instructions for practice for 1888 are full of elaborate directions about the necessity of previous drill. Here are some of them. "Non-commissioned officers and gunners should also be trained to the ready and rapid handling of ammunition, boring and fixing of fuzes, etc. * * and firing —they should know perfectly the look of the ammunition and stores, where to find them and their use"—and so forth in the same strain which alone tells its tale! But in spite of all this what says the Commandant in his report? "The batteries generally are insufficiently trained."

In 1889 "qualified layers" were instituted, and provision was made for a man other than a No. 1 laying a gun, and in the "Instructions" Battery Commanders are told that they must make certain that their non-commissioned officers can be trusted to lay steadily according to order without attempting to make any corrections of their own. It seems

to us now to be going back into the dark ages to think of men *purposely* setting their sights wrong; but I was amused this year by a little incident which makes me suspect that in that respect at any rate we are ahead of the infantry. A Battery Commander obviously over-estimated the range; it was 900 and he gave 2000. One of the "Course Officers" immediately turned to me and said "But, of course, they won't set their sights at that," and I do not think he believed me when I said that they certainly would. In 1890 at last we read "the practice shows marked improvement, especially in the direction of fire discipline," while the rate of fire has increased by 42 per cent. with no falling off in accuracy. Officers were waking up to the necessity of really drilling their batteries for practice, and not relegating all gun drill to afternoon parades under the subaltern on duty. And the 1891 instructions state that "batteries can and must be exercised in the whole system of ranging and fire discipline as a drill." Commandants are ordered to inspect batteries on arrival, and Lieut.-Colonels are made responsible that their preliminary training has been "systematic and sufficient." The improvement once started was steady —again we read after the practice "This year shows a great advance in fire discipline" but that the standard was scarcely what ours is may be inferred, for, in spite of this great advance, "the practice of Nos. 1 ordering their guns to be fired without any command from "Section Commanders" is only "not so prevalent as heretofore." Things had, however, got so far that in this year's Okehampton lecture the subject of having more than one layer was mooted, and though a Commanding Officer declared that at Woolwich such a thing was "almost an impossibility" the idea was started and in 1892 the eighteen layers have become an accomplished fact. In 1893 the examination of layers and fuze-setters, which had been instituted at Okehampton in 1889—with somewhat startling results—was ordered for all camps. And last year, I am thankful to say, that the state of training arrived at allowed of the elimination from the "instructions" of all those elaborate directions for previous training which, though they had been dwindling steadily, still amounted to two pages in 1893—it being simply stated that the preliminary training must be "as complete as possible." Now that also has gone. This gradual disappearance of all instructions on that head is, I think, the most convincing proof of the change in training.

Elementary Practice.

To turn now to Elementary Practice. What happened in 1888? The solemn farce was enacted of showing the results of mistakes by firing a gun with one wheel higher than another, with a damp cartridge and so forth. How well most of us here must remember that "ducking" of the cartridge in the centre of a ring of gaping gunners—and then the crowd collected to see the gun fired. Unfortunately the mistakes never "came off." Next year we have got so far that "officers are to be instructed in the command of the battery," and the battery is to be accustomed to fire discipline, and it is very justly pointed out that this cannot be "satisfactorily carried out unless the battery practises with

at least four guns." Think of a Battery Commander now leaving half his guns in camp when he went out to practice! In 1890 it is directed that no mistakes are to be purposely made for the "sake of illustration" and somewhat humourously gives the reasons "as error in judgment is sure to produce some, if not all, of these faults during practice." In 1892 at Okehampton, and next year universally, a great change was made in the nature of the elementary practice. The three effective shrapnel system having done its work at service practice is relegated to elementary; times are to be taken; and generally the elementary is to become a real preparation for service practice. With this change in its nature soon came a reduction in the number of rounds allotted to it. The 180 rounds of 1892 has dwindled twenty rounds a year until this year only 100 rounds were allowed. The question naturally occurs—is further reduction advisable? As long ago as 1892 Colonel—now General—Ward in his Gurgaon report said that he "considered the amount allotted to elementary excessive, and that fifty rounds should be sufficient to put a finish to the education of the drill-ground," and this year General Tyler proposes reducing it to twenty-five; while General Murray thinks that only the recruits rounds should be allowed for it. That is getting perilously near extinction. Already I think some officers are asking whether elementary really does any good and whether men do not get into bad habits at it. On the other hand it does seem hard to take a battery straight to service practice. Probably we are all agreed that this year's allowance of 100 rounds may safely be reduced, but the question is "how far?" The last Brigade Division at Okehampton this year being on a lower scale were only allowed sixty rounds, and they certainly did not appear to be at any disadvantage when they came to service practice.

Battery Service Practice.

In Battery Service Practice the first point to notice is that in 1888 only four rounds were allowed for finding the elevation, showing at once how little the difficulties of the task were understood. Then the use of an observing party seems to have been obligatory for we have as the sequence of events (1) the advance; (2) range-finding and (3) establishment of observing party. Apparently the opening fire was to be delayed till all this was done, and no doubt necessarily, for the observing parties were sent as much as 1000 yards to a flank whence they signalled every round. Next year the glaring absurdity of such procedure is noticed, and we find that observers are to be trained to observe from a flank of the battery though observing parties are still used when possible. The great point of the year's practice was, however, the introduction of the "three effective shrapnel" system. I cannot imagine anything better adapted for the purpose of driving into everybody's head that *hitting* was not a simple matter of course. The system then was more rigid than now, for it was laid down that "no battery *will under any circumstances* be permitted to change to another target until the desired effect has been obtained, *however great may be the number of rounds* which may be required to obtain that result." When a battery fired away round after round at

an easy target without being able to put in three effective shell it must have been evident to those most opposed to "the new ideas" that something was wrong. For the next year or two, things went on much in the same way, but in 1891 in the discussion here two warnings were uttered—certainly not before they were wanted. Two inventions, each useful in its place—were being run to death by their injudicious admirers. I refer to the deliberate method and to Scotts' sights. From a careful reading of the instructions it seems to me that no other system of occupying a position at practice was contemplated, and the deliberate, as we now understand it, is dashing compared with the deliberate of those days. Of the injudicious use of Scotts' sights I have already spoken. In 1891 they seem to have been almost universally employed—even with case!

In 1892 tactics made its appearance. Everyone had been convinced of the necessity and of the difficulty of hitting and so "three effective shrapnel" dropped back to elementary. Each days service practice was under a tactical scheme, but service conditions were scarcely attempted—no doubt the time had not arrived for it. Batteries knew their targets and the number of rounds they had to fire at each before they went out, and the orders given were scarcely such as they would receive on service; for instance a General who wished a battery to advance would not send an order "prepare to advance" first! In 1893 and 1894 there was little change in the general conditions of practice. In 1893 surprise targets were introduced and in 1894 an infantry moving target. What was done this year I have already described.

Taking the battery service practice generally it is easy to follow the changes. At first it was a mere question of target shooting; from a certain spot you had to hit a certain thing. Elaborate preparations were made beforehand and all attention was directed to the task of hitting—and rightly so—for until that was mastered it was useless to complicate matters. As batteries improved and Battery Commanders became experienced in the control of their fire the movements into position were studied, the barrier between gunnery and manœuvre was broken down. Batteries came into action at Aldershot field-days as they would at Okehampton, and when they came to Okehampton manœuvred as they had learnt to do at Aldershot. We all admit that fire discipline and fire tactics are both necessary for the effective application of our fire, and *now* I think we are all agreed that they must be practised together. But this feeling is only of recent growth. I remember the horror caused at Okehampton in 1888 when attempts were made to manœuvre a Brigade Division. Everyone was most indignant "we don't come to Okehampton to *drill!*" was the cry.

Brigade Division Practice.

About Brigade Division practice there is really little to say. In 1888 a system was laid down for the Lieut-Colonel to "range" his Brigade Division, but that quickly dropped out and it was recognised that the battery was the unit for fire discipline and the Brigade Division for fire tactics. In consequence the question of tactics came in earlier for the Brigade Division practice than for the battery, and

the first instructions for choice of position and formations when moving under fire will be found under this head. But until batteries became fairly adept in the mere dry bones of "target shooting" little good could accrue from practice in Brigade Division. Our present drill-book is practically silent as to the method of commanding a Brigade Division in action, and wisely so, because three years ago there was really little known: but in that period great attention has been directed to this point, and no doubt the new edition will contain definite rules founded on the experience gained. If we are to fight by Brigade Divisions we must practice in them. The importance of much of the fire discipline is not appreciated at battery practice, and the great falling off in this respect at Brigade Division practice shows the urgent necessity for more of it. I look forward to seeing *the greater part* of service practice devoted to it.

Competitive.

I turn now with some fear and trembling to the thorny subject of competitive. We may dismiss without comment the years 1888, 1889 and 1890 when the extraordinary system of individual shooting, from the evil results of which we are only just free, was flourishing. In 1891 Battery Competitive was introduced, and we may say that Competitive, as we understand it now, has been going five years. There is no doubt that we are immensely indebted to it for the great development of fire discipline in those years. If only it was conducted in service marching order we might also be indebted to it for the most thorough trial of our equipment as it will be on service. But it is no test of tactical efficiency, and, granted the good it has done in the past, we should honestly ask ourselves what is it doing now? There are, I know, those who think that like Frankenstein we have created a monster which has almost got beyond control. When we read of one camp that "In order to place the batteries on the same footing as those which fire a greater number of rounds the elementary and service practice was conducted with a view to the final test in the competitive;" when we know, as we all do here, how much of the practice of the twenty-five batteries at Shoeburyness was sacrificed to competitive, we may well ask ourselves very seriously whether, granted all its good work in the past, competitive now does more to advance than to retard the great object of "training for service;" whether in fact it has not done its work.

Organization.

Such a review as I have attempted would be incomplete without a few words as to what, for want of a better word, I have called "organization." In the first years of the period I have selected, the position of the Commandant at Okehampton was both local and temporary. He had no official position outside Okehampton, and directly the camp closed he officially ceased to exist. While, on the other hand, at the School of Gunnery, where the instructions for practice, the hand-books and the gunnery portion of the drill-book were

prepared, there was no official representative of the Field Artillery. It appears to me wonderful how things progressed as they did under such a system. Of course, as a matter of fact, the Commandant at Okehampton did exercise influence during the off season, and there were officers at the School of Gunnery who were well acquainted with Field Artillery requirements, but it might not have been so. I think we must all be agreed how much better it is that the Commandant at Okehampton should also be the official representative of the Field Artillery at the School of Gunnery, and that the Field Artillery Instructors there should be sent every year to Okehampton and Glenbeigh to keep touch with the practical part of their work. With the appointment of the "Chief Instructor" for Horse and Field Artillery came the combination of all the reports from the practice camps into one, so that those who wish for any information as to the practice of the year have only to go to this one report.

The "Instructions for Practice" show clearly the progress made towards practical work. For many years it was full of special arrangements for shooting at practice camps, and elaborate instructions for ranging, laying, etc., with not a word about the drill-book. In 1889 indeed there is mention of the rules for ranging being given in the drill-book; but this is immediately followed by pages of variations from those rules. It is not till 1892 that there is a disposition to really view the drill-book as the authority. In that year we are told that "Field Artillery Drill is the basis on which practice is to be conducted," strengthened in 1894 to "Field Artillery Drill is the authority on which all practice is to be conducted," and with this recognition of the drill-book as not only a "parade" work comes the natural shortening in the Instructions for practice. If we omit the part devoted to range parties, filling in of practice reports, description of targets, and so forth, most of which is only of moment to the camp staff, there are but five pages. From 1888 to 1892 the average was 24!

Of course, all *changes* in instructions, drill-books, etc., are an evil; but I think if we are to have any progress they must be recognised as a necessary evil, and as I have pointed out all changes have been reductions! The drill and hand-books also must require amendments: nothing human can stand still without stagnating. The thing to be considered is how these necessary alterations can be made as little worrying as possible. They used to come out at any time. The present system is that at the end of the drill and practice season a conference is held by the Commandant of the School of Gunnery at which the Commandants at Okehampton and Glenbeigh are present and discuss all points brought forward, and suggest any necessary amendments. These, if approved, are published in January, and at no other time are amendments made. I think it is of the utmost importance that these amendments should only be made once a year so that batteries having received them may feel at ease for the year at least. So much is this now held that though it was decided early this summer that "pricking the cartridge" was to be done away with, no alteration will be made in the drill until next January.

CONCLUSION.

In conclusion, gentlemen, I would draw your attention to a passage from the first lecture of what I may perhaps call the Okehampton series. Speaking hear seven years ago, Colonel Walford said, "Outside the regiment there is the army, and the verdict of the army on the regiment is that by which we must stand or fall, must gain or lose prestige." Since then we have given every opportunity to officers of the other arms to see us at our practice camps—not only in England, but in Ireland and in India. It is because I am so impressed with the truth of the words I have just read to you and with the value of the closest co-operation between the arms that I have to-night so often quoted the opinions of cavalry and infantry officers. I will finish my lecture with one more of such quotations, the words of a staff officer who draws a direct comparison between the first and last year of the period I have chosen for review. Writing this summer he says "I was struck with the splendid fire discipline of the artillery, and the absence of all noise in the battery. This was especially noticeable to me as in 1888, when I for the first time served with artillery, I was struck with the noise and shouting which took place. Now, however, the artillery go into action with almost complete silence. Could not the infantry take example from their artillery comrades, and like them have their men so trained by constant drill practice that every man will know his duty, and, like the gunner, do it without noise and without confusion."

DISCUSSION.

The Chairman—Gentlemen, we have listened to a most interesting and instructive lecture—very interesting indeed in its retrospect. Any of us who look back to the year 1888 can remember the shocking waste of ammunition before that time. I commanded a Brigade Division that went to Okehampton that year, and I well remember that the Books of Instruction were issued to some batteries on the line of march. It was not wonderful, therefore, that not much advance was made that year. But still, some jumped at it at once and made a good start. Looking on from that date it is perfectly marvellous the advance that has been made, and the only thing to do is not to rest satisfied, but for every one to seek where we can improve and go on making progress, remembering always, as the Lecturer has pointed out to us, that nothing can be done for the Regiment in general unless we work on one system and under one rule. The drill-book is drawn up as the result of combined experience, and unless each one sticks closely to it no good results to the Regiment at large can ensue.

We have a number of officers here to-night who have been shooting at and attending camps, which I am sorry I have been unable to do this year, and I hope that they will give us the benefit of their experience and that we shall have a very useful discussion.

Colonel Marshall—I agree thoroughly with everything that the Lecturer has put before us in the most interesting way, and I will only just refer to one or two, as I think, most important points.

In my opinion the most important point that the Lecturer brought forward—I may say the key-note of everything that he said to-night—is the training of the battery for service; the training *for service* is the object of all practice. The Competitive it is hard to find fault with; we know the good that it has done; any fault that has to be found with the Competitive in its present state arises

from the great zeal and great anxiety to come out well. There is no doubt that this has diverted us somewhat from service practice; it is quite possible to direct this zeal into its proper channel: it has been talked over by several battery officers, and schemes have been put forward by them to bring the whole of the service practice into the Competitive; but it would be impossible to work it every day, the strain would be so great on the staff. That is one proposal; I think it is not practicable; we should require a separate staff, or two or three, to keep it up, and the strain on the batteries also would be very great. There is another plan that might answer, and that is to have some marks, say 100, given to the Commandants at Glenbeigh and Okehampton, and for those marks to be allotted for the service—the *whole* of the service practice—keeping of course the fire discipline marks in the Competitive as at present merely forming an extra lot of marks for the service practice. I hope that something of that kind may be introduced next year and that it will meet the difficulty.

Then another very important point which Captain Headlam also criticized was the Brigade Division practice. We want more and I hope we shall have more of it. One cannot help feeling in that matter for the Brigade Division Commander. The Brigade Division is the only tactical unit in the service of which the Commander has no permanent staff whatever. He has no Adjutant; he has to take an Adjutant from one of the batteries. He has no Sergeant-Major; he has to go to one of the batteries for a Sergeant-Major. One feels for him in that situation. How can he keep up continuity of drill and training, especially from the tactical point of view, without a proper staff. I am sure when the authorities realize this, it will be put right, and I am certain it will have a good effect on the Brigade Division practice.

Major Rich—There was a point in the Lecture that was very interesting to me because last year I was on the Cavalry Manœuvres, and I ask this for instruction—it is a doubtful point I think as to cavalry ranges—close ranges at 1500 yards. In the drill-book a certain ranging system is laid down against cavalry, but from my own experience the moments are so fleeting in which you get the chance of shooting at cavalry on the move, always on the move—if you fire one shot they are on the move—that I should like to ask Colonel Marshall, whose opinion I value more than most men's, whether it is not right to open with time shrapnel. The Lecturer carefully pointed out to us that the hard and fast rule which is laid down about ranging in our drill-book is not always likely to be of advantage on service or anywhere else. I do not think myself that in that sort of thing one would go through a ranging process very often. That is the only thing I should like to be instructed on.

Colonel Marshall—The Chairman says that I may answer you at once. I think that it is legislated for in the drill-book; you can open at once with time shrapnel at short ranges.

Major Hunt—There are one or two points that I should like to ask the Lecturer about.

I did not follow what Captain Headlam said about being in somebody else's hands with regard to wagon supply. It seems to me that if the Battery Commander orders the wagon supply and the Captain sticks half a mile away on a hill with the wagons, it is a simple thing for him to send on to the battery and say "I cannot go on;" but if it is left for the Captain to order the supply as he likes, the limbers will not know what to do: they will come into action and will not see where the wagons are and there will be no command at all. I have never considered the matter before, but from the lecture I do not see how any other person but the Battery Commander can do it.

I want also to ask whether there is to be any elasticity allowed as to the distance

of the limbers in rear of the guns in action. I know that General Keith Fraser objected to it, and I am told that this year General Luck would not have it at any price; he said he did not care whether it was laid down or not, he would not have the limbers stuck there affording a much larger and more conspicuous target. Now we are bound to the 10 yards though there may be an excellent position perhaps further off, and that of course increases our target for the enemy tremendously.

Colonel Yorke—Might I ask a question in connection with the limbers going away some of them at the gallop? I do not know whether the rate that they are to go is exactly laid down. The old way was this: when they came into action they trotted round and went away at the walk. The system in our Brigade Division was that they should go away at a steady walk as long as they were under cover if they were going far back; but if they had to cross any ground that came under fire and were exposed then they had to go at the gallop, to break from the gallop into walk. I do not know whether that is considered the right thing, but that is what we did.

Major Baldock—With regard to the position of the limbers and wagons, I wish to ask whether they are supposed to cover all guns in action. In some Brigade Divisions at Aldershot it was the rule always to cover the guns; whether there was cover to right or left, the wagons and limbers were to cover their guns; they might seek cover at the front or rear within limits, but they were never to move to the flank or to keep anything but the full interval between the guns and the limbers. In other Divisions, if there was a little bit of cover to right or left, they were often placed there altogether in a lump, more or less under cover, and sometimes the wagons and limbers of two or three batteries would be all huddled together within a small piece of cover. I should like to know which is the correct way of placing the wagons and limbers: keeping them at the full interval whether there is cover or not, or keeping them huddled together so as to keep them covered.

Captain Strange—Can the Lecturer give us any figures about the range at which battery officers should order case shot when resisting an attack of cavalry? He mentioned that the target was put up at 600 yards. I ask this because at Shoeburyness last week I was watching some experimental practice at case shot and I noted that the bullets at 300 yards failed to penetrate 2-inch deal, and it does not seem to be of much use beyond that range I should think. It was a 12-pounder Mark I. gun.

Major Newton—This year there was a slight alteration in the system of giving points for fire discipline. Batteries were under observation for fire discipline from the commencement of the First Series until the end of the Third Series, and I think some batteries lost points for what I submit are minor irregularities of *drill*, but hardly faulty *fire discipline*, such as inaccurate dressing of the serrefile rank, and slight inaccuracies in intervals. I submit that such minor irregularities should not be taken notice of as faulty fire discipline under this new system of observing the batteries from the commencement of the series until the end in advancing between one position and another.

Major Paterson—The Lecturer asked for the statistics of the infantry firing at Glenbeigh this year.

There was a detachment of 200 infantry and 4 officers and they fired for three days. They fired at artillery targets on each day; their ranges were always given to them and they were always in position before they opened fire.

On the first day they fired at 26 dummies representing a 4-gun battery in action, the same target as our long range competitive target, but the range was 1800 yards. They first fired at the battery facing them; 90 men fired 10 rounds

apiece, 900 in all, and the effect was one man hit with one bullet. They fired for eight minutes. The method of firing was left to the infantry commander, and he always adopted section volleys. They then fired at the same 4-gun battery in enfilade; the dummies were shifted round, but placed facing the men who were firing to give them every chance, and the result was two men hit with two bullets.

On the second day the target represented a battery coming into action; the horses were exposed for one minute and then switched off; the infantry went on firing at the battery in action for about three minutes and then the horses were turned on for another minute to represent the battery limbering up and going away. About 180 men fired and they began at 1000 yards and went back to 1200 and then 1500 yards. 24 horses were represented, that is to say there were screens 8 feet long by 6 feet high, each representing 2 horses; if there were two or more hits on one of these screens two horses were supposed to be hit, if there was only one hit one horse was supposed to be hit. At 1000 yards, out of 24 horses 18 were hit on coming into action and 8 were hit on the exposure in limbering up. That was acknowledged at the time to be too heavy a loss to be suffered. They then went back to 1200 yards, and on coming into action 12 horses were hit, and on going out of action 14 horses were hit. At 1500 yards 8 horses were hit in coming into action and 2 on limbering up. During the fire on the battery in the intervals 8 men were hit out of 18 dummies.

On the third day a battery was fired at representing a column of route; 180 men fired 1250 rounds in 6 minutes. The range was 1300 yards. There were 20 dummies out of which 8 were hit, and 24 horses out of which 20 were hit. The battery was stationary; it was supposed to be checked by some obstacle. Some of the chief deductions drawn from these data were that it would be dangerous to come into action against infantry under 1200 yards, and dangerous to move in column of route exposed to fire under 1500 yards. There was no range over 1800 yards fired at artillery, but they fired at 2300 yards at infantry targets with very little effect.

Captain F. R. Maunsell—I should like to say something about the importance of practising laying on indistinct targets; which will be a practical difficulty on service owing to the use of smokeless powder and indirect laying.

It is a point to which a great deal of attention is being given in the German Field Artillery, which I had several opportunities of seeing last summer at Metz, both at standing gun-drill and at battery drill.

That targets on service, especially that presented by the enemy's artillery, will be more indistinct than formerly, seems to have been fully recognised. Battery officers and all the sergeants had field-glasses which were constantly used in picking up the various natural targets selected by the Battery Commander.

Most of the standing gun-drill parade was devoted to practising the layers in rapidly picking up various objects in the Moselle valley visible from a corner of the barrack square.

A short description of the fresh object by the battery C.O. prefaced the change of target, which in many cases was only visible to the gun-layers after the Section Commanders and Gun Captains had searched for it with their glasses and had pointed it out.

"Stand fast" was occasionally given by the C.O. who then made sure that the particular target ordered had been laid on. Laying by clinometer and lining pickets was carried out frequently at battery drill. One picket was used by each gun, and was of wood, about 5 ft. 6 in. high, painted in alternate bands of black and white, and carried strapped to the trail when not in use.

When laying back on the picket a sword-bayonet stuck in the grass was used to mark the position of the right gun-wheel at each successive round.

REPLY.

CAPTAIN HEADLAM—I will take the few points which have been brought forward in order.

As to firing at cavalry targets at over 1000 yards, 1500 yards or so, I said that the tramway was most useful at Okehampton, because it was of the utmost importance that batteries should know, *what they cannot know now*, how to deal with such targets. We have never had any practice in shooting at anything like fast moving targets at over 1000 yards. And I do not think anybody knows exactly what would happen; we may have theories on the subject but it would be much better that we should have facts, and I hope that the tramways at Okehampton will give that very valuable practice next year.

Then about departing from the hard and fast rules, of ranging in the drill-book, I hope I was not generally misunderstood to mean that one should leave the rules in the drill-book. I said that the variations *allowed by* the *drill-book* were not taken advantage of. Such variations as that against an enemy in a disadvantageous formation we should commence time shrapnel without verifying, and that in very short ranges we could open with time shrapnel immediately. As to this latter case, you must remember that on coming into action you have always your guns loaded, and these six percussion shell in your guns ought to be enough to establish some sort of bracket. I do not believe in firing time shrapnel without having bracketed at all, however short the range. There were cases at Okehampton this year where the practice was entirely thrown away without any effect, even at the closest ranges, simply from blazing away without knowing what the range was.

About the wagons, the point that I wanted to bring out was that at present if the wagons are delayed for some reason or other the Major does *not* find it out; he cannot look for them and the Captains, at Okehampton at any rate, did not send him word when delays took place. As a fact, the limbers went away from the guns and the guns were left alone. I do not set up to discover a way out of the difficulty, but what I put forward for your consideration was the danger of allowing the limbers ever to go away *until it was quite certain that the wagons were available.* How you do it I do not care, but I think the limbers should not be allowed to go away as they do now, until it is quite certain that the wagons are available. I think that on service you would find the gunners looking uncomfortably over their shoulders if they found themselves with neither wagons nor limbers near them.

As to the position of the limbers of Horse Artillery with cavalry the question of ammunition supply comes in. If you let your limbers go away more than 10 yards (and I think in most cases to get under cover they would have to go considerably more than that) the difficulty of ammunition supply comes in at once. No doubt that point will be considered by the drill-book committee. What we have got now is of course very plain upon the subject.

About the pace for limbers going to the rear at "wagon supply," the drill-book says that their pace is the trot. We know that for moral reasons it is distinctly ordered that guns retiring are to retire at the walk. I do not believe that infantrymen would ordinarily distinguish between a limber with a gun behind it and a limber alone, and I very strongly hold that if you let the limbers trot in peace, they are very likely to gallop in war. The effect on infantry coming up expecting to see the artillery in position if instead they were met by eighteen limbers galloping to the rear might be very disastrous.

Then with regard to what Major Newton said about marking for fire discipline. He spoke of "slight inaccuracies" in the intervals between the sub-divisions as "minor irregularities." This year the intervals varied from thirty-five to eight yards! I thought I had put forward a strong case for the importance of intervals,

when I told you how from the neglect of it in one Brigade Division a battery was completely shouldered out. If you have two or three Brigade Divisions in action as well as other troops it is likely to be still more important.

About the range at which Battery Commanders should order "case," it is laid down in the drill-book as soon as the enemy get within 500 yards. If you order "case" at 500 yards I do not think you will get the first round off against galloping cavalry until they are pretty close on 300 yards. The subject of the weight of case bullets is important and I believe that experiments are being made. I think it is doubtful (and other officers no doubt agree with me) whether our little case bullets would stop a horse.

About the Glenbeigh experiments of which Major Paterson has told us and which are so interesting, there is one point to remember and that is that they were on sand and that sand is the most favourable thing for infantry because the man can sometimes see his bullets hitting on it as he cannot on ordinary ground. And also it was scarcely fair conditions. On a hillside you do not know exactly where a battery is coming into action. I should like to see infantry at Okehampton told that a battery is coming into action on a certain hill and not told the exact spot or moment and six cavalry targets (which would represent the teams very well) pulled over the crest of the hill fifty yards down the front, at the walk if you like, and back again and then see how many hits they would make. The time during which a battery coming into action shows itself is very little. I was in splinter-proofs during a great deal of the practice this year and it struck me, when you come to look at it from the target point of view, that a battery is not such a big thing as you think; six guns coming into action quickly give little opportunity of shooting. In the case of one that came well down the hillside into action; from the moment we saw the Battery Commander's head appear over the crest until the first gun went off was only one minute 20 seconds. I do not think much harm could have been done in that time.

As regards indistinct targets, I am myself a great believer in the use, as soon as we get a good clinometer, of indirect laying against such targets when they are like artillery in action. But I hope that no one will misunderstand me when I say indirect laying and believe that I am advocating going behind a hill and firing over the top. I mean using the clinometer instead of the Scott's sight for elevation the direction being given from the handspike. The practice would then be quicker and more accurate. But it is impossible for a moving target; you can only use it for guns in action or against shelter trenches where there is no chance of moving.

I do not think there has been any other point brought up which I could attempt to answer.

THE CHAIRMAN—Gentlemen, it only remains to us to accord a very hearty vote of thanks to Captain Headlam for giving us this most interesting lecture. I had hoped that more gentlemen would have given us the benefit of their experience who have been through the manœuvres this year and which would have provoked further discussion; but I am sure that we shall be unanimous in according a hearty vote of thanks to Captain Headlam. (Loud applause.)

Note.—I find that I accidentally omitted to reply to Major Baldock. The drill certainly appears to only recognise the position directly in rear for the limbers and wagons, and I can not see how any other can be worked where you have not only more than one battery but other troops as well. In the case Major Baldock quoted of all the wagons and limbers of a Brigade Division being huddled together under cover imagine the confusion when the Brigade Division was ordered to advance—particularly if a brigade of cavalry or infantry had slipped in between the guns and the limbers—by no means unlikely!

INCIDENTS OF BUSH WARFARE.

PRÉCIS OF A LECTURE BY

MAJOR W. D. CONNER, R.E.,

PROFESSOR OF FORTIFICATIONS AT THE R.M. ACADEMY, WOOLWICH.

(Delivered on behalf of the Royal Artillery Institution at the Banquet Hall of the Castle, Dover, at 5 p.m. on Thursday, 30th October, 1895.)

COL. G. J. BURGMANN, COL.-ON-THE-STAFF, COMMANDING R.A., S.E. DISTRICT, IN THE CHAIR.

THE CHAIRMAN said he should like to explain that the lecture took place under the auspices of the Royal Artillery Institution. Hitherto all their professional lectures had taken place at the theatre of the Institution at Woolwich, but the Committee thought they might try and extend the sphere of the work of the Institution by causing lectures to be given at the large artillery centres, and this was the inaugural lecture which came under that scheme. He wished to be allowed to introduce to them Major Conner of the Royal Engineers, Professor of Fortification, who had kindly come down at very short notice to give them a lecture on "Incidents of Bush Warfare" to be followed by a discussion. He hoped that officers who had taken part in that style of rough fighting would join in the discussion, and Major Conner would be glad to answer any questions in connection with his lecture.

MAJOR CONNER then delivered his lecture, which dealt with the following subjects :—

How little the history of our small wars is studied in this country.

With three exceptions all our wars since the Crimea have been against undrilled barbarians.

Points of difference in civilized and uncivilized warfare.

Disparity of numbers.

Necessity for taking the initiative.

Opportunities afforded to junior officers.

Individual night attack peculiar to savages.

Technical skill secondary to readiness of resource.

Literature on the subject of Savage Warfare recommended to the notice of young officers.[1]

[1] *See* Appendix.

War in New Zealand, 1860-65.

Incidents exemplifiying the courage, superstition and dexterity in retreat shown by the Maoris.

Account of the disastrous attack on the Gate Pah.

Ashantee War (*73-74*) alluded to.

Zulu War. Defence of Rorke's Drift referred to.

Afghan War.

Perpetual annoyance by marauders at night.

Raids on villages.

Destruction of towns.

Precautions for ensuring successful demolition.

Examples of success and failure.

Operations of the French in Tonquin and Assam (*82-86*).

Fighting merits of the Chinese.

Possibility of the formation of a very formidable Chinese army in the future.

Details of the elaborate siege of Tayen Kwang by the Chinese and Black Flags.

The French in Algeria.

Similarity to our small Indian Wars.

Special rules for reconnoitring and crossing rivers.

Necessity for flank defence exemplified by French disaster at La Rahonia.

Sundry camp and field fortification expedients.

Burmah.

Bamboo palisades and spiked obstacles.

Siege of Sadon as related by Lieut. MacMunn, D.-S.-O., R.A., in R.A.I. "Proceedings."

Stanley's Expedition to Central Africa.

DISCUSSION.

Major-General E. A. Wood, C.B., said he had been asked to make a few remarks upon what they had heard so ably delivered. He was sure all those who had heard it could see how much there was to learn in those little wars, and perhaps before they left that subject the lecturer would tell them the names of one or two works that might be of use to them. He knew that there had been numbers of applications lately received at the War Office for such works. There was an immense desire on the part of young officers to encounter sufficient fighting, as soon as they got into the army. He did not think the lecturer had at all exaggerated any details of the difficulties the English had encountered, and where they struck him as being excessively correct was in Afghanistan, but the lecturer had omitted to tell them that in some of the lines of communication so serious was the effect of night attacks, perhaps from the want of search lights or proper information, that a large amount of small ammunition was fired away during the course of the night; in the morning the report always came in that the natives had succeeded in carrying off their dead. It was hard to say whether there were

many dead to carry away. He could only repeat what he said and advise the younger officers to look up all they possibly could. If he related any of his own experiences it would only take valuable time.

Colonel Adam wished to say a few words upon what he considered would be of importance in connection with bush warfare. His remarks would be short and confined to three points. The first was this: if they turned back to what the Russians did in the Caucasus and what the French did in Algeria they would find that in every case the forces had to be assisted by friendly natives. These natives were acquainted with all the features of their country and it was always advisable to employ men who were acquainted with the ways and customs of the enemy. The next was one that he trusted would soon be remedied. If they looked back to the history of their past wars, one was struck at once by the want of a corps of pioneers which could have rendered an immense amount of assistance. He need not tell them of the work of the 32nd Pioneers at Chitral, and he only trusted that the time would not be long before they saw a strong corps of pioneers attached to the British Army, not only soldiers but civil engineers. "The spirit of the age runs into division of labour, and of professions into branches. The engineer now-a-days is no longer a general factotum but either a bridge, a mining, a railway or an electrical engineer. This applies in my humble opinion just as much to military as to civil engineering, and the former should be split up into submarine mining, electrical, fortification, building, etc. departments, the officers being kept as much as possible for good and all in the various branches.

But besides the above, there is a minor branch which hitherto has not received in the British Army the attention it deserved—it is that of pioneering—I am strongly in favour of a strong corps of pioneers being raised. They should be trained—

1st. In road making through jungly, hilly and marshy countries.

2nd. In laying rails and the general rough work of a railway.

3rd. Rough bridging with such materials as are available close at hand, erection of landing piers at a place of disembarkation, rough rafts, cask pontoons, etc.

4th. Rough building of huts and houses at a base, with quarrying, brick making, brick burning, well sinking, and

5th. Lastly the construction of field works.

Summed up I would take an excellent little manual published many years ago by Captain Forde, Madras Engineers, as a type of the instruction required. There is also a very good manual used at the American Academy at West Point which could serve as a guide.

If the corps were to be raised, I would, heretical though you may consider my views and opinions, make it a point not to officer it from the regular forces but take the officers at first exclusively from—

1st. Engineers who have been employed on railway, dock and other works in England.

2nd. From the same men employed at the Cape, in Canada and in India.

3rd. From deserving non-commissioned officers of the Royal Engineers, with one or two from Garrison Artillery and Marines.

You may perhaps say, that's a curious jumble. It may be so but none the less I think the system would work well if you took care to select your officers and men.

Let me now cast a rapid survey on what such a corps could have done had we possessed such in our past wars.

1st. They would have been invaluable in Bulgaria and at Balaklava during the Crimean War.

2nd. They could have rendered great assistance during the Persian War at the place of disembarkation; also in China.

3rd. In New Zealand our operations would have been much facilitated.

4th At the Cape we should have found them of great assistance; ditto in Abyssinia when once on the plateau.

5th. In the Egyptian War of 1882 we should have had the railway opened up much more quickly and have had several piers rapidly put together at Ismailia.

Suppose that by any chance we had to disembark a force in Asia Minor, would not such a corps be of the greatest value? We have but to refer to Knight's "Where Three Empires Meet," to see what use can be made of a corps of pioneers commanded by such a man as Mr. Spedding. But the best proof of the want of such a corps can be obtained by reading the Blue Books containing the House of Commons' reports regarding the Crimea, Abyssinia, New Zealand and Egyptian Wars.

Lastly they would serve as trainers of our regular infantry whenever it became necessary to employ them for road making and military works during field operations.

The above is necessarily only a brief sketch showing the utility of a pioneer corps."

The third point was one that was spoken about the other day by Major Simpson of the Royal Artillery.[1] It was that their Mountain Artillery is not at the present moment provided with a suitable weapon; something more was required, to be added to their 7-pr. mountain gun and that was a howitzer. He believed some experiments had already been made with regard to this; and in the case of the Gate Pah, he was firmly convinced that had the artillery possessed weapons suitable for high angle fire we would very soon have taken the place. Major Simpson had brought it especially to notice and had shown that though the present gun was a fine one, for straight shooting, it was not adapted to driving an enemy out of earth-works. He daresay that attention had been drawn to it and a remedy would be provided.

Colonel O'Brien, R.E., said he should like to ask the lecturer whether in the course of his researches, in the instructions for troops in bush fighting, he had come across any advice as to the way a column should work in cutting through the bush and clearing the way for the troops. Of course in work of that kind it was not perfectly straight cutting, and when they came across a path they naturally followed it and the result was a winding zig-zag path.

Major Conner in reply said he should be delighted to send down the names of any suitable books on his subject. The official account was always trustworthy, though perhaps not always interesting, still it was always a basis to go upon, and one could read other works afterwards. He could bear out every word General Wood had said about the fighting on the Kyber road because he believed that was what he was referring to. He related an incident which showed that the Afridis did not always come off scot free from their night attacks.

We have always been indebted to friendly natives in all our wars, and if it had not been for the friendlies we should have had great difficulties to contend with.

[1] R.A.I. "Proceedings," No. VI., Vol. XXII., 2nd June, 1895.

With regard to the attack on the Gate Pah, of which Colonel Adam spoke, the artillery might have been better used, but we had some big howitzers and mortars of different sorts there. About the working along the bush paths of which Colonel O'Brien had asked, it was difficult to give advice to fit every circumstance that might arise but that matter was dealt with very ably in a R.E. "Occasional" paper written by Lieut.-Colonel A. R. Dorward, R.E. It was a duty that was often better performed by native troops than English.

Major-General Lord William Seymour said he hoped Colonel Burgmann would convey to the Royal Artillery Institution, what he was sure they were all feeling, their best thanks for the lecture they had heard that afternoon. He was sorry to say that his own experience of bush fighting was nil. He begged to move on behalf of the company assembled, that a cordial vote of thanks be accorded to Major Conner for his interesting lecture. This was carried with applause.

APPENDIX.

The following is a list of some books dealing with the campaigns referred to in the lecture :—

"Campagnes de l' armée d' Afrique." Duc d' Orleans.

"The Ashantee War," Brackenbury.

"Engineering Operations on the Gold Coast." Lieut.-Col. Home, C.B., R.E. R.E. "Professional" Papers, Vol. XXIII.

"The Afghan War of 79-80." Hensman.

"Recollections of the Kabul Campaign." Duke.

"Campaigns in Burmah." Parsons.

"Military Posts in Burmah." Major A. Dorward, D.-S.-O., R.E. R.E. "Occasional" Papers, Vol. XVI.

"Reminiscences of the War in New Zealand." Gudgeon.

ADJUSTABLE POINTERS

FOR

CONCENTRATING THE FIRE OF GUNS IN GROUPS,

WORKED BY

POSITION-FINDER, AND FOR DRIFT CORRECTION.

BY

MAJOR LATHAM C. M. BLACKER, R.A.

The question of being able to concentrate the fire of guns arranged in groups and fought by position-finders is one which has attracted considerable attention from time to time and serious proposals have been made towards carrying out this object.

As far as I am aware no satisfactory plan has yet been devised, so I venture to put forward the following device of an adjustable pointer adapted to the purpose. In the first place there are two factors to consider, one is that supposing the normal case of four guns on a straight front under existing arrangements, when they are trained at the centre of their arcs, the lines of fire will be parallel and, say the guns are at a minimum distance of 15 feet apart, then the line of fire will be 15 feet apart and the shots should strike the water 15 feet apart.

But supposing the pieces are trained extreme right or left then the lines of fire will be found to be only about 12½ feet apart. This difference will of course affect very accurate concentration and should be taken in account if thoroughly precise results are desired.

Of course were expense no object it will be possible to devise very accurate adjustable pointers concentrating exactly at any range and at any angle of training, but except in the case of new mountings, and as the position-finding dials can only be read to $\frac{1}{8}$ of degree, it does not seem worth while.

The following plan provides for an inexpensive alteration to existing pointers whereby accurate concentration can be effected at every 100 yards and for extreme right and left traverse. This will be found quite sufficient for ordinary purposes and will put an additional powerful weapon in the hands of Battery Commanders enabling them to explode four common shell at one spot in the unarmoured part of a vessel if desired, this adding greatly to the fire effect of their com-

mands. There are two or three ways of altering existing pointers to effect this, but I will deal with the simplest first.

We will suppose the ordinary group of 4 10″ R.M.L. guns, 15 feet apart (the distance varies but this is about the least as a rule). The length of a degree (with 21·7 feet radius of arc) is about 4 inches and the $\frac{1}{4}$ degree marks are 1 inch apart.

Now with No. 2 gun as the gun of direction, corrections must be given to the angles of training of Nos. 1, 3 and 4 as follows:—

At 1200 yards, 15 minutes is equivalent to 15 feet, thus at 1200 yards a correction (with the guns in the centre) of $\frac{1}{4}$ degree to 1 and 3 and $\frac{1}{2}$ degree to 4 will concentrate the fire of the group at that range, similarly—

At 2400 correction for 15 feet = $7\frac{1}{2}$ minutes or $\frac{1}{2}$ inch.
„ 3000 „ „ „ = 6·5 „ „ $\frac{7}{16}$ „
„ 3600 „ „ „ = 5·6 „ „ $\frac{3}{8}$ „
„ 4200 „ „ „ = 4·6 „ „ $\frac{5}{16}$ „
„ 4800 „ „ „ = $3\frac{3}{4}$ „ „ $\frac{1}{4}$ „

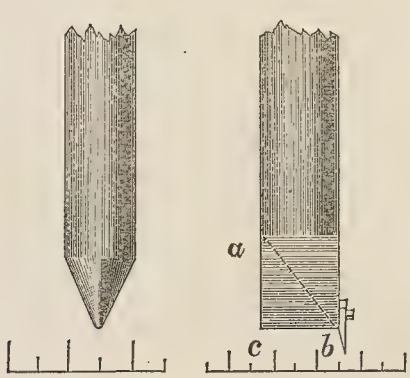
As $\frac{1}{4}$ degree on the arc = 1 inch.
∴ $3\frac{3}{4}$ minutes „ „ = $\frac{1}{4}$ „

it will be thus sufficient (at that training) to move the pointer of 1 and 3 $\frac{1}{4}$ inch and that of 4 $\frac{1}{2}$ inch inward in order to concentrate at even 4800 yards.

The concentration for the intermediate ranges will vary in proportion but as the divisions would be too small on that scale a multiplying arrangement becomes necessary. On examining the present service pointer it will be seen that it can be turned round on its longer axis through a semicircle.

It is necessary only to fix a small brass pointer to its edge as shown in Fig. 1. The revolution through a $\frac{1}{4}$ circle will move this pointer 1

Fig. 1.

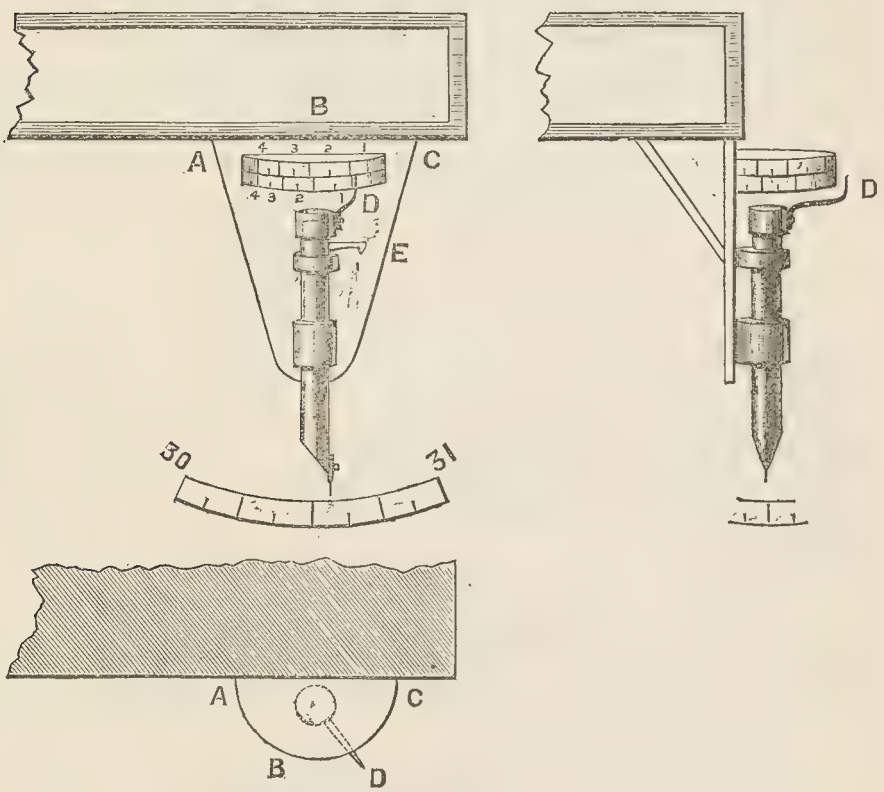


inch to one side. A revolution through a $\frac{1}{8}$ circle about $\frac{1}{2}$ an inch and so on.

By turning the pointer round as much as is required any desired nicety of correction can be obtained. (It would be as well to cut away the edge *a b c*). Now to obtain this nicety a multiplier in the shape of a drum and index must be fixed at the top of the bolt which constitutes the present pointer.

FIG. 2.

FRONT ELEVATION. SIDE VIEW.



Note.—For convenience of reading and to get the graduations on the drum in front, the index had best be fixed to one side.

The index points at *D* round a narrow drum *A B C* several inches in diameter (so as to get the division sufficiently large for easy reading) on which are marked the corrections for various ranges. By making the radius of this drum sufficiently large, say about 3 or 4 inches, the graduations may be made as fine as to hundreds of yards up to 2500 yards and every 300 yards above that.

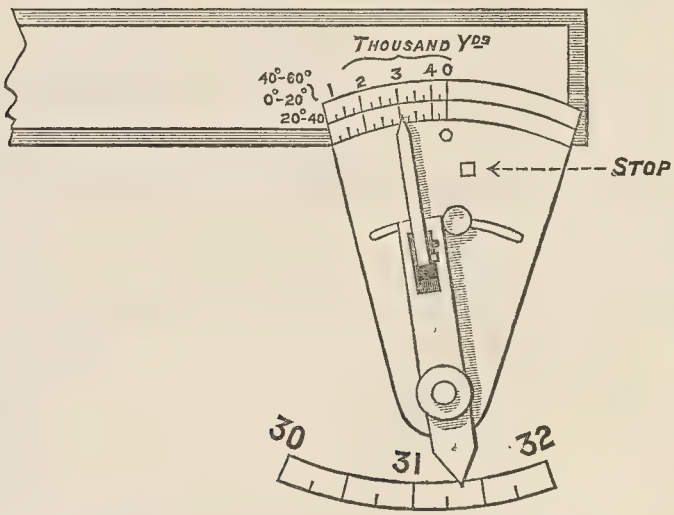
For No. 4 gun which requires a correction twice as great as No. 3 the drum must be proportionately of greater radius. The small brass pointer of No. 4 gun must also be fixed 1 inch further out.

The arc of the drum must also be larger if the guns are further apart,

though in that case it would be better to have a swinging pointer, thus, giving a larger arc for the graduation of corrections.

Fig. 3.

Front Elevation.

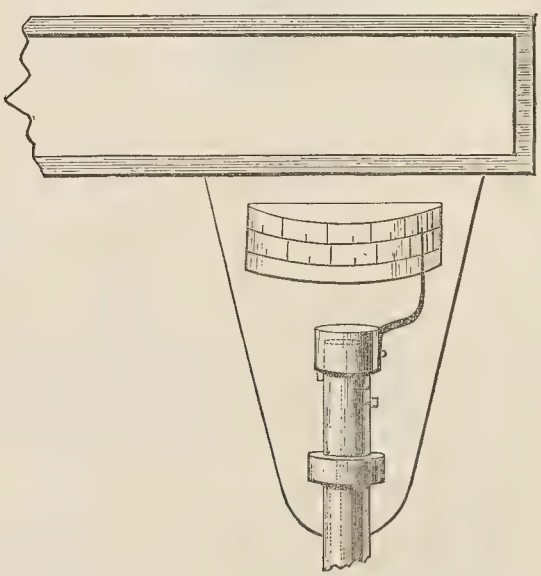


Note.—As a general rule for guns far apart and large corrections the swinging pointer will be most suitable. For small intervals and corrections the revolving pointer.

The swinging pointer can be made to any desired degree of accuracy by increasing the length of the upper arm.

Now taking the other correction for extreme angles of training it will be easiest to have these two arcs for corrections one above the other, thus :—

Fig 4.



with a vertically sliding pointer moving up and down in a collar on the

top of the bolt so that the index can be set to either of the scales one of which is for the centre of the arc and the other for the extreme right and left.

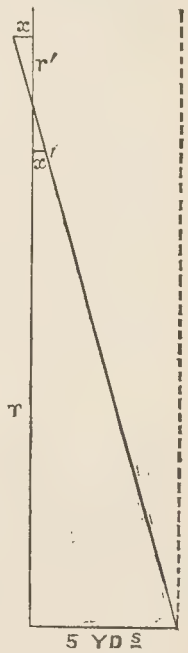
Or else the index might be made to set back at the collar a certain amount to allow for extreme trainings. With the swinging pointer index and a horizontal drum this training correction can be carried to high degree of accuracy and might be especially useful when firing group salvoes at long ranges from high angle guns worked by position-finder.

When laying the process is simple enough. The gun-layer pushes his index up or down according as it is extreme training or not, and when the final range is called out he sets it at that range and then traverses his gun to the training called out. With the swinging pointer a clamp should be provided and with the revolving pointer a little rack with notches just under the handle *E* will hold the bolt steady. The power of thus concentrating at will should prove a great advantage, making practice more attractive and easier for the operators to correct and estimate their shots.

On the greatly increased fire effect it is perhaps needless to dwell as it is surely obvious.

APPENDIX A.

FIG. 5.



$$\frac{r}{r'} = \frac{5}{x} \qquad \text{where} \quad r = \text{range.}$$

$$\text{,,} \quad r' = 100 \text{ yards.}$$

$$x = \frac{5 \times r'}{r} \qquad 5 \text{ yards} = \left\{ \begin{matrix} \text{interval} \\ \text{between guns.} \end{matrix} \right.$$

Substituting values of r and r' we have at 1200 yards range—

$$x = \frac{5 \times 100}{1200} = \frac{5 \text{ yards}}{12} = 15 \text{ inches.}$$

$\therefore$ lateral error at 1100 yards or 1300 yards = 15 ins.

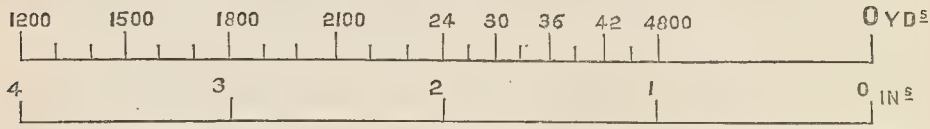
For 4800 yards we have—

$$x = \frac{5 \times 100}{4800} = \frac{5 \text{ yards}}{48} = 3\tfrac{3}{4} \text{ inches.}$$

therefore to concentrate within 15 inches or 2 feet according to interval of guns it will be sufficient to divide the scale at every 100 yards up to 2400 yards andbeyond that at every 300 yards up to 4800 yards.

The scale will be somewhat as follows, supposing the upper scale to be multiplied about 4 times. If necessary the divisions on the scale can be enlarged by multiplying six or eight times.

Fig. 6.



It is evident that under the present system of non-concentration there must be a certain waste of ammunition as the unarmoured portion of a ship is rarely as long as the front of a group; and also when firing at a vessel advancing towards the battery, unless of great beam, 3 out of 4 shots must miss. The correction of fire also is very puzzling for the operators, especially when firing single shots, if they are not certain which gun has fired.

The correction for drift, with full charges could also be allowed for in calculating the graduations on the scales of the pointer, as this saves the operators a troublesome correction (which indeed has now to be neglected up to 4000 yards).

The correction for drift for reduced charges would necessitate an extra pair of scales also graduated for concentration and fixed beforehand. A modified amount of concentration could at any time be applied by setting the scale for double the range.

MAJOR-GENERAL WILLIAM PHILLIPS.

THE following memoir of Major-General William Phillips is republished from No. 7, Vol. XIII., R.A.I. "Proceedings," to draw attention to a remarkable interest in his services that is being taken by some gentlemen in Virginia, U.S.A.

These gentlemen, represented by Mr. Lassiter, wish to erect a monument in the churchyard of old Blandford, Va., U.S.A., to the memory of this distinguished soldier and think that the officers of the Royal Artillery would like to subscribe towards the cost of erecting it. Mr. Lassiter is kindly providing the granite and undertakes all the business and trouble of the matter.

The Committee of the Royal Artillery Institution authorise the Secretary to receive any subscriptions officers may care to send; they think that these should not exceed 5s. each and will be much obliged if Commanding Officers will allow subscription lists to be placed in Officers' Messes and the money so collected forwarded to the Secretary R.A.I. in a few weeks' time.

Mr. Francis Rives Lassiter says of Major-General Phillips, "I have had prepared a photograph of the old Blandford Church, near this city (Petersburg) showing the angle of the ruins where General Phillips was buried in May 1781. Permit me to hope that the R.A. Institution at Woolwich will accept the picture as an evidence of my respect for a British Officer of unusual distinction.

The memoir was written by the late Sir J. H. Lefroy, C.B., K.C.M.G., R.A.

He was appointed a Gentleman Cadet, 1st August, 1746 and a Lieutenant Fireworker on the 2nd January of the following year.

He held the appointment of Quarter Master of the Royal Regiment of Artillery from the 1st of April, 1750 until May 1756, receiving during that period his commission of 2nd Lieutenant (March 1755) and 1st Lieutenant 1st April, 1756.

Lieutenant Phillips was Aide-de-Camp to Sir John Ligonier, Lieut.-General of the Ordnance; and on 12th May, 1756 received the commission of a Captain of a Company for the purpose of proceeding to aid in defence of Minorca, then besieged by the French.

Captain Phillips never held the rank of Captain-Lieutenant.

He is particularly mentioned in Smollett's History for his distinguished services with the allies in Germany, more especially during the actions of Minden and Warburg.

At the battle of Minden, 1st August, 1759, Major Phillips commanded the Artillery, and His Serene Highness Prince Ferdinand, in thanking the troops after the battle, presented Captain Phillips with 1000 crowns as a testimony of his great satisfaction at his gallant behaviour in the action, as well as a mark of his particular esteem.[1]

At the Action of Warburg, 30th July, 1760, the Marquis of Granby stated that the British Artillery commanded by Captain Phillips made such expedition that they were in time to second the attack in the most surprising manner, and the retreat of the French was attributed to the effect of the British cannon and Dragoons.[2] No doubt Major Phillips shared in the other engagements of the allies of the same year, viz :— Emsdorff, Kloster-Kampen, Fritzlar, Cassel and Kirchdenkern.

On the 15th August, 1760, Major Phillips was promoted to the rank of Lieut.-Colonel in the Army, and succeeded to the rank of Colonel in the same, 25th May, 1772.

In 1776, Colonel Phillips was serving in Canada with the Army under Lieut.-Generals Sir Grey Carleton and Burgoyne, and at the Battle of Skenesborough near Ticonderoga and Mount Independence, North America. His Major of Brigade (Captain Bloomfield, R.A.) was wounded, and Captain Green, 31st Regiment, his Aide-de-Camp, was killed. The Artillery in this action was very numerous.

Colonel Phillips did not succeed to a majority in the Regiment until 25th April, 1777, while on the 29th of August of the same year he attained the rank of Major-General in the Army.

In the action of Still-Water, near Saratoga, 19th September, 1777, Major-General Phillips commanded the left wing of the Army ; and it is recorded that in one instance during the battle his presence of mind had nearly saved the Army when, at the most critical point of time, he restored the action by leading up the 29th Regiment.[3]

At Saratoga, October 1777, he conducted the retreat and was the second senior at the Council of War, 13th October, when, from the strength of the Army, General Burgoyne was obliged to surrender to the Americans. [4]

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[1] " Superlative practice on *our* right by Captain Phillips," says Carlyle, describing the effect of the British Artillery at Minden.

[2] " Captain Phillips," says an eye-witness, " brought up the English Artillery at a gallop and seconded the attack of the Cavalry in a surprising manner."

[3] This was the battle at which a Battery under Captain Thomas Jones, with Lieutenants Hadden and Reid, was so distinguished. Jones was killed, and *all* the N.-C.O.'s and men were killed and wounded, except *five*. " Hist. of the American War," by C. Stedman, London, 1794, I., 338 ; " Hist. of the War with America, &c.," by J. Andrews, LL.D., London, 1786, II., 403, 404. *See* also Duncan's " Hist. of the Royal Artillery," and a paper on Phillips in the "Proceedings," R.A.I., IV., 248.—*H.W.L.H.*

[4] It should be remembered to the honour of the American General, Gates, that he refused to permit his soldiers to witness the humiliation of the English as they piled their arms. *See* Stedman.—*H.W.L.H.*

The last promotion of Major-General Phillips was that of Lieut.-Colonel in the Regiment, bearing date 6th July, 1780.

In 1781, Major-General Phillips was attached to the Army, under Lieut.-General Sir Henry Clinton at New York, and proceeded with 2000 men, the *elité* of the Army under his command, on the 20th March at Rhode Island, to prevent the French troops sailing for the Chesapeake. The troops were frequently engaged both with the enemy on land and the shipping, but in May following the General was seized with a fever, which deprived the Army of his abilities, although he continued to travel with it. Unfortunately for his army, General Phillips' disorder proved too strong for the power of art to remove, and he breathed his last at Petersburg the 13th May, 1781.

In him the King and his nation lost a most excellent officer.

LEADING EVENTS OF MARLBOROUGH'S MILITARY CAREER.

1672-3.—Campaigns under Turenne, along the Meuse.
1689.—Combat of Walcourt.
1690.—Capture of Cork.
1690.—Capture of Kinsale.
1702.—Siege of Venloo.
1702.—Siege of Roermond
1702.—Siege of Liege.
1703.—Siege of Bonn.
1703.—Siege of Huy.
1703.—Siege of Gueldres
1703.—Siege of Limburg.
1704.—March up the Rhine, and to the Danube, May-June.
1704.—Schellenberg stormed.
1704.—Bavaria ravaged.
1704.—**BLENHEIM.**
1704.—Capture of Treves.
1704.—Capture of Trarbach.
1705.—Manœuvres along the Meuse.
1705.—Manœuvres on the Dyle.
1706.—**RAMILLIES.**
1706.—Capture of Louvain, Mechlin, Brussels, Ghent, Antverp.
1706.—Siege of Ostend, Menin and Dendermond.
1707.—Manœuvres of Marlborough against Vendôme.
1708.—Startling successes of Vendôme.
1708.—**OUDENARDE.**
1708.—Siege of Lille.
1708.—Convoy action at Wyiendale.
1708.—Siege of Ghent.
1709.—Siege of Tournay.
1709.—**MALPLAQUET.**
1709.—Mons.
1710.—Siege of Douai.
1710.—Capture of Bethune.
1710.—Capture of St. Venant.
1711.—The *ne plus ultra* lines of Villars.
1711.—Siege of Bouchain.
1711.—Marlborough superseded, Dec.

T.M.M.

CARTE

du Théâtre de la Guerre des Alliés

COMMANDÉS

PAR LE DUC DE MARLBOROUGH

GRAVÉE

Par ordre de Sa Majesté Impériale & Royale

NAPOLEON Ier.

Echelle de 1 2 3 4 5 6 12 18 24 30 Lieues communes de France.

Echelle de 1 2 3 4 5 6 12 18 24 30 Lieues de Brabant.

Scale 10 10 20 English Miles
about 40.

A. Paris, de l'Imprimerie Impériale, 1808.

[1]MARLBOROUGH AND HIS METHODS OF WARFARE.

BY

T. M. MAGUIRE, ESQ., LL.D.

(A Lecture delivered at the Royal Artillery Institution, Woolwich, 30th November, 1895).

FIELD-MARSHAL THE RIGHT HON. VISCOUNT WOLSELEY, K.P., ETC., COMMANDER-IN-CHIEF, IN THE CHAIR.

GENERAL SMART—Gentlemen, Lord Wolseley, the Commander-in-Chief, has kindly consented to take the chair this evening at our lecture. He is an honorary member of the Institution (applause).

THE CHAIRMAN—It is the usual custom, gentlemen, I understand, to call upon the Lecturer—I do not say to introduce him to you, for, I believe, that is almost unnecessary, because I think I may say, at the risk of paying him a compliment to his face, that he is about the best known Lecturer in England. I have heard him lecture on many occasions, and I have always derived a great deal of pleasure and profit from what he has told us; and I am sure that the subject which he has taken for this evening is one upon which he will be able to tell us a great deal to interest us, and also to give us instruction (applause).

DR. MAGUIRE—My Lord, and gentlemen, I must say that I feel no small amount of anxious diffidence in rising in the presence of your Lordship and before such an exceedingly distinguished gathering of the chiefs of a large section of the British army to address you, my Lord, and this audience on the splendid operations of a predecessor of your Lordship in the command of the illustrious British army. It is the fashion of many military critics and also of no small number of civilians to disparage the exploits of the British army; but for my part, while I am quite willing to pay all honour to the colossal forces of the continent—to the massive organisations of France, of Germany and of Russia, I think there is very much to be said, not only about the fighting qualities of individual Englishmen as individual soldiers, but also about the exploits in every land of a race which is perpetually fighting, whereas the enormous hordes of the continent only fight now and again. There are officers in this room who since 1870 have

[1] This lecture was quite *extempore* and illustrated by large wall maps.

seen more service than the officers of half-a-dozen German army corps put together. Again there is another reason—not only because Marlborough was a predecessor of your Lordship's as Commander-in-chief, which renders him particularly interesting at the present moment, and that reason is that in his own time Marlborough at the battle of Blenheim was not only Commander-in-Chief of the British army, but also Grand-Master of the English artillery (applause).

I do not propose this evening to weary you with any details of the private character of Marlborough. To me the study of his private character has been neither very profitable nor edifying nor instructive. We are here to discuss his public character, and if he had some faults in his private character, his faults were so entirely overbalanced by his virtues that we may well forget them; and even if he had considerable faults, as Britons we are bound to remember not some of these faults, but the grand services, the immortal benefits, which he conferred upon his native land. Bolingbroke I think settled once for all the value of any discussions as to the private character of Marlborough. Somebody was talking about his avarice before Bolingbroke. At the time Bolingbroke was a personal enemy and a political opponent of Marlborough, and conduced in no small degree to his fall while in the very plenitude of his career of victory. What was the reply? "Do not talk to me of Marlborough's avarice; talk to me of his victories. When I remember these I forget that failing of his" (applause). This evening, gentlemen, I propose to deal with his victories. You may say, why not also deal with his defeats? Well in point of fact I cannot remember any of his defeats. He is about the only soldier who had command of a coalition under the most extraordinary difficulties with a heterogeneous bevy of mercenaries under his command, as well as troops of his own country, who never failed. There was a proverb about him: that he never entered upon an engagement that he did not win: that he never entered upon a negotiation in which he was not successful: that he never sat down before a fortress which he did not take: that he never courted a lady without gaining entire possession of her good will: and that he never lent money at less interest than ten per cent. (laughter). The two latter phases of his character may be ignored; the three former we must dwell upon. But before dwelling upon his exploits on the continent I just wish also to mention another matter—his career at home. I am not in the least degree elated by remembering that certain Englishmen were fighting and killing each other at the battle of Sedgemoor at which, by the way, the Royalist success was entirely due to our hero. I think they would have been far better employed in killing some foreigners on the continent. I do not care at all about the disputes between Marlborough and William III. William III. had his failings as well as Marlborough, and had his ambitions as well as Marlborough. William III. however did great service to this country, and I will not enter into any comparison between him and Marlborough. Let us then at once go to Marlborough on the continent, where he won eternal fame, not only for himself but for his compatriots.

Marlborough began his career under Turenne, one of the greatest

masters of the art of war since Julius Cæsar—he fought in Holland at Nimeguen. His gallantry—Marlborough's I mean—gained him high commendation from Louis XIV., who had a wide experience of able and daring commanders. At another Dutch fortress, Maestricht, he saved the life of his commander, the Duke of Monmouth. He then came home, and we must pass over his career again till the last days of William III. and the commencement of the war of the Spanish Succession.

Lord Bacon makes a very wise remark in his "Essay on the Vicissitudes of Things," when he says that on the breaking up of great Empires we may look for long continued wars. This pithy remark he illustrated by the fall of the Persian Empire, by the fall of the Roman Empire, by the beginning of the decay, as it was in his day, of the Turkish Empire, but he did not live to see it illustrated by the fall of the Power that was strongest in his time, that is to say the Spanish Empire. We are living to see it illustrated with regard to a vast Eastern Empire. What may become of China must "make us pause." At the beginning of the eighteenth century the last Spanish King of the House of Austria, Charles II., dying and leaving no heirs, his dominions immediately became the object of the ambition of a great number of princes. His dominions were almost as wide-spread as the British Empire is now: he ruled not only Spain, but Belgium; he ruled a considerable portion of the north of Italy and also the two Sicilies; he held sway over a great part of the south of North America and South America and over the West Indian Islands and over the Islands of the Indian Archipelago. I need scarcely say that a patrimony such as this was a good bone of contention. Louis XIV. wanted it, first for himself directly and ultimately for his grandson; the Austrians also wanted it; the Bavarians wanted part of it; England did not exactly want it, but she wanted to prevent France from becoming more influential and upsetting the balance of Power, and accordingly a tremendous coalition was formed against France, consisting of Holland, England, Austria, and several smaller German States, such as Prussia, and in due time also Portugal and Savoy. There was fighting in Spain, as you all know, which gave us Gibraltar and made the name of Peterborough famous; there was fighting in Italy illustrated by a remarkable march of Prince Eugene and by the battle of Turin; there was fighting at sea; it is not our text to dwell much upon that; but it must be slightly dealt with later on and fighting in Belgium and Germany—and we must dwell upon that. The fighting began so far as Marlborough was concerned in 1702. I think Major Abdy has put a little chronicle on the side of the map of the general theatre of operations. It began in 1702 with matters that I do not think I have time to set forth, but which were of considerable importance at that time. Holland was in danger of an invasion through Belgium by French troops; the German princes on the Lower Rhine were connected with France, for example the Elector of Cologne, the Prince Bishop of Liège and others, and it was necessary before going further that Marlborough should secure the left flank, looking south, of Holland, even as the right, looking south, was secured by the fact that the

English and the Dutch commanded the sea. Accordingly, if you look at the little map, you will observe that it was necessary to take some fortresses along the Meuse and Rhine so as to command the Meuse and the Lower Rhine, and therefore he took Venloo and Ruremond, and in the next year places like Cologne and Bonn. But nothing celebrated occurred from the point of view of military history till 1704; but this year is from a military point of view one of the most important dates in the history of the world. I say Marlborough, now a Duke, had secured the left flank of Holland, looking south, by his victories along the Meuse and the Rhine. But a grand scheme was formed against the House of Austria which would probably overwhelm it. The Austrian dominion was to be attacked from Hungary by Ragotsky; from the south of the Danube in the direction of Passau by the Elector of Bavaria, and the Elector of Bavaria was to be reinforced by great French armies coming through the Black Forest—by Marshal Tallard and Marshal Marsin. Here then the Court of Vienna was almost *in extremis*. It sent a force north of the Danube under Prince Eugene. Eugenio von Savoiè he called himself, as being a combination of a Frenchman and an Italian, and by employment an Austrian. But he would have been quite unable to cope with the French forces coming from the Rhine and the Bavarian forces. Marlborough took command of the united Dutch and English troops and the miscellaneous Hessians, Danes, and others in their pay, and he drew up a plan of operations which completely deceived the French and ultimately saved the House of Austria. Bacon, in another of his Essays, says that the helmet of Pluto which enables a politic man to go invisible is secrecy in counsel and celerity in execution. With regard to secrecy in counsel Marlborough was a past-master, as you will see in a moment. He asked the Dutch to defend their country against any assault from the Belgian fortresses northward, whereas he proposed to go up along the Rhine and thence along the Moselle, and to invade France by the valley of the Moselle. This would not take the British army very far from Holland and it appeared a feasible operation. I hope I convey myself sufficiently clearly by the aid of this Belgian map, which is a fairly good one; it is very difficult indeed to get really good wall maps. Just look at the relative positions of the Meuse, the Belgian fortresses, the Moselle, the Maine, the Neckar, the Danube between Ulm and Ratisbon. Marlborough started from about Ruremond, he went up the Rhine to Cologne and thence to Bonn—he used the Rhine itself for his baggage. Surely, my Lord, and gentlemen, it is very interesting to remember that at the beginning of the eighteenth century the British army should be advancing up the Rhine towards the heart of Southern Germany; he came to Mayence, and had an interview with the Duke of Hesse, and then he wrote to say that he would not exactly invade France by the valley of the Moselle; indeed he had already deliberately slipped past the valley of the Moselle; but he said that a very good plan would be to go a little further up and thence turn inwards to the attack on France. When he got near the Neckar he announced his intention of going to the Danube, and it was too late to recall him. Up to that moment nobody, I believe, knew of his intention except Godolphin at home and the Dutchman Heinsius.

PLAN
DE LA BATAILLE
D'HOCHSTETT
(BLENHEIM)
le 13 Aoust 1704.
GAGNÉE PAR LES ALLIES
COMMANDÉS
PAR LE DUC DE MARLBOROUGH,
Capitaine Général des troupes Angloises,
Grand Maître de l'artillerie, &c.

Tableau Indicatif.

A, B, C. *Marche de l'Armée des Alliés sur 9 colonnes.*

D *Nebél bach ou Hazelbroeck.*
E *Batteries des Alliés.*
F *Batteries de l'Armée des deux Couronnes.*
G *20 bataillons commandés pour attaquer Blenheim.*
H *Marche des Franco-Bavarois vers les Alliés.*
L *Deroute de la Cavalerie Franco Bavaroise.*
N *Ruisseau appellé Brunnen bach.*
O *Retraite de la Cavalerie de l'Armée des deux Couronnes en confusion de Lutzingen vers Morselingen.*
P *Lieu où Tallard fut pris.*

FORCES.

ALLIED FORCE;—about 52,000 men and 52 guns under the Duke of Marlborough and Prince Eugene. Loss 12,000.
FRENCH FORCE;—about 60,000 men and 90 guns under Marshals Tallard and Marsin, and the Elector of Bavaria. Loss 26,000, but the army was practically ruined.
According to Creasy, BLENHEIM was one of the "Fifteen decisive Battles of the World."

T.M.M.

A. Paris, de l'Imprimerie Impériale, 1808.

The great Duke then made a very remarkable march over the Neckar through the Suabian Alps to Mondelsheim where he met for the first time his future colleague, the already famous Prince Eugene. Advancing along, making a flank march past the Elector of Bavaria, whose lines were near Dillingen, he came to the Schellenberg, a hill north of Donawerth on the Danube, which is marked by a cross on the map of the series of operations. He there thoroughly routed a considerable portion of the Bavarian army; with such bravery did the British guards and other troops fight that the Emperor of Germany (the old German Empire of which Austria was the head was terminated in 1806, and the Empire revived again in 1871 with Prussia at the head) sent him a congratulatory epistle in which he pointed out what a remarkable thing it was that Marlborough had been able to conduct the troops of England to victory in a territory where the name of England had never been heard before. Following up his success at Schellenberg, he passed the Danube south, near Donawerth, he then passed the Lech, near Rain. Rain has been a very important decisive point, it had previously been the scene of a victory by Scotch troops under Gustavus Adolphus. Having passed this river he wrote to the Elector of Bavaria asking him to give in, and offering liberal terms—but the Elector, learning that troops were coming from the Rhine, refused to give up his alliance with France, whereupon Marlborough levied what he called military contributions on the Bavarians; in other words, he proceeded to burn the villages up to the very walls of their capital. I have read many censures on such operations, and our American cousins and other philosophic humanitarians stood aghast at the mention of great military executions of this kind before 1861. They were most eloquent in denouncing Marlborough and all his doings. I do not want to say a word against General Sherman, but General Sherman's American friends never wrote a book on that text after he went marching through Georgia in 1864. This American leader did much worse things to his fellow countrymen than Marlborough did to the Bavarians. Now our hero was suddenly obliged to recall his troops from this business in Bavaria by the fact that Eugene had to fall back before Tallard who came through the Black Forest on to the Danube, and that the Elector brought his troops into line with Tallard's. This led to the battle of Blenheim, one of the fifteen decisive battles of the world. There is a map of it here, and as I will not have time to dwell upon everything I just merely roughly sketch it on the board. The position is so clearly set forth in the sketch map that I need not spend much time upon it. Observe the river Nebel, Blenheim itself, the marsh in the centre, the villages and woods on the left, the line of retreat, to Dillingen and the Danube. Eugene was sent round against the Elector of Bavaria and Marsin to the right, Marlborough himself waited in the centre, and a general called Cutts, "Salamander" Cutts from the manner in which he stood fire, came on the left against Blenheim. Cutts was repulsed on the left. Eugene got on with difficulty and delay on the right. Marlborough had to wait till the pressure of Eugene was distinctly felt. The French dispositions by Tallard were exceedingly bad. Mons. Fouquieres points out that Tallard made twelve distinct mistakes of the very grossest kind in this one battle (*see* Appendix). One of the principal of these was the

manner in which he arranged his centre. I have a French critic here who says that the most admirable thing from a tactical point of view about Marlborough is that he had an absolutely certain tactical *coup d'œil*—that he perceived the least faults of his enemies and knew always how to take advantage of them. He immediately saw the fault there and he led a mass of cavalry through the centre; he isolated Tallard from the left; he compelled the people in Blenheim to surrender; the centre and left retired in the utmost confusion to the rear, and many were driven into the Danube. That is exactly, if I may be allowed to say so, almost a counterpart of the battle of Waterloo, or rather the reverse of it. At the battle of Waterloo there was a strong position on the English right—that the French assailed—there were positions on the English left—those the French assailed. Jerome's corps assailed the English right, D'Erlon assailed the English left, and then a huge mass of cavalry was thrown against the English centre. The difference was that, whereas that the manœuvres directed by Marlborough broke the French centre and ruined the French right, the same manœuvres directed by Napoleon produced little or no effect on the British infantry (applause). Now every one was elated at the battle of Blenheim. There was one poet called Phillips and he was amazingly elated—he was so elated that he wrote the following poem. As I said a feature of the battle was that many French were driven into the Danube. He said:—

"Think of ten thousand gentlemen at least
And each man mounted on a capering beast,
Into the Danube they were pushed by shoals."

Macaulay says a few more poems like that would have prevented Marlborough from winning any battle at all for the future. Accordingly the Secretary of State went to Addison the poet who wrote a worthy treatise in poetry on the subject, called "The Campaign," in which he, for the first time, pointed out what is the differentia of a general—that is not going about killing people by the thousand on a capering beast; it is simply coolness of head and the entire possession of clear faculties in a most tremendous crisis with awful surroundings for himself and for his country; it is *mens æqua in arduis*. And Addison was enabled to illustrate this quality of highest merit and of supreme importance, not merely for Marlborough's time but for all time, by the celebrated simile of how an angel presided over a terrible storm which had recently passed over Britain. This is really a very excellent summary of the best qualities of generalship, and as I am speaking to quite a number of future generals, I hope I may be allowed to quote from it. After speaking about the tumult and terrors of a battle-field, he says:—

"Twice then great Marlborough's mighty soul was proved
That in the shock of charging hosts unmoved
Amidst confusion, horror and despair
Examined all the doubtful scenes of war,
In peaceful thought the field of death surveyed,
To fainting squadrons sent his timely aid,
Inspired repulsed battalions to engage
And taught the doubtful battle how to rage."

I think that passage, gentlemen, was a fine poetical inspiration and almost as good a description of the true merit of Marlborough as any narrative by a military critic.

Now it is not often one reads English history in Latin, and more is the pity. I am quite convinced that if Mr. Lecky would only publish the history of the British Empire in Latin it would immediately enter into the curriculum of the public schools and perhaps be set in due time at competitive examinations, and the result would be that English gentlemen, to whom the destinies of their country will in due time be entrusted, would know something of the conditions of their country's greatness, and the extreme glory of their nation in the past—but I have here a Latin testimonial to Marlborough. Well, gentlemen, I would not care for reading it in Latin; you have read quite enough yourselves—but it sets forth that he led from the Thames and from the Meuse a strenuous host which entirely overwhelmed the forces of Gaul and Bavaria, and which, in the crisis of the German race, delivered it from its enemy (*see* Appendix). Having done this, gentlemen, he gathered up the spoils of war in the shape of numerous prisoners, standards and weapons, and proceeded westward again. He traversed the Rhine near Philippsburg; he invested Trêves and Trarbach and took them; he proposed to invade France again, but he found himself stopped this time in the valley of the Moselle. He found himself stopped by an entrenched camp at Sierk, now very ably constructed and held by Villars. He now learned that Villeroi was invading Belgium and had constructed another very extensive entrenched camp from the Meuse, east of Namur, right along for fifty miles to where the Rupel joins the Scheldt. Marlborough resolved to break through that entrenched line—behind which Villeroi had some 70,000 men, I think, and there were very few officers of the period who would have dared to attack him. Marlborough tried and succeeded. He sent the Dutch General Overkirk round to the Mehaigne to make a very strong demonstration against Villeroi's right. He himself massed near Wacken and withdrawing the other troops to his aid, pushed through the centre. The result was that at once Villeroi had to abandon all the lines which had been constructed with such great care and to fall back on Brussels. Marlborough would have forced the Dyle, and would probably have fought a battle on the plain of Waterloo, only for the hesitation of the Dutch. Thus ended the campaign of 1705. By the way, Wellington admitted his obligations to Marlborough in regard to teaching him how to act upon this plain.

I forgot to mention a very remarkable thing in connection with the campaign of 1704. Gentlemen, one advantage of studying the past is of course to get a knowledge of the present. Napoleon was a most careful student of the history of the past—he was an accomplished scholar in military history from his earliest days. He went to Egypt, I believe, because Alexander the Great went there as much as for anything else; he went over the Alps because Hannibal passed them, and why should not he? and he certainly went to Donawerth on the Danube following in the footsteps of the Englishman, Marlborough. This admits of no doubt whatever, because he ordered a book to be

published to celebrate the triumphs of Marlborough. It is almost a shame to think of the evil effects of party spirit in England. There is no writer of the period who praised Marlborough so much as did the greatest enemy whom ever England had, that is to say Napoleon. In point of fact Marlborough got more abuse for winning the battle of Blenheim in England than Tallard got for losing it in France. But there was no party spirit in France at the period (applause). "Honour," says Napoleon's editor, "great honour to the writer who shall have any share in the immortality of Marlborough, and one is much astonished at not finding abundance of biographies of his life. In France, as well as in England, his name" (this was printed in 1808) "resounds every day in the midst of us, it is repeated without ceasing by our very children and our nurses." Gentlemen, to be mentioned by nurses and children is the truest fame of all, and probably the most permanent, for the children will remember from their nurses when they forget everything else. "We constantly have sounding in our ears a song full of the fame of Marlborough" that is of course the curious old song "*Malbruk s'en va-t-en guerre.*" Now, if Napoleon ordered these sentences to be written I hope you, gentlemen, will excuse me for not exactly following in the footsteps of Napoleon, but for this evening adding a humble tribute to the fame of our most illustrious soldier.

Now what greater things can be done than to conduct a British army and troops of many other nationalities from Ruremond to Cologne, from Cologne to Mayence, thence to give an example to Napoleon of how to get to the Danube, then to traverse Bavaria, then to get back again to the Rhine, then to fight along the Moselle, and finally to almost fight a battle in 1705 on the very battle-field where the fate of Europe was determined in 1815. You may say we could not do that now. Why, gentlemen? I do not see any reason in the world why we could not do similar things now. Let me for a moment recall the resources that Marlborough had. I see that some of my audience think that a German army on the Danube might be a troublesome business, or a French army between Metz and Paris; but why could we not be ready for great enterprises? The fact of the matter is, if we cannot do as great things now, that it is not for the lack of resources, it is for lack of energy, determination, strength of will and for no other reason: *possunt quia posse videntur*. What was the population of England in the time of Anne? not more than 8,000,000 in England and Scotland together. What was the population of France then? 19 or 20,000,000. What is the population of the United Kingdom now? 38,000,000. What is the population of France now? 38,000,000. Do not you see that the population has changed enormously in favour of England. The capital of England in the time of Anne was about £490,000,000; the capital of England now is much more like £12,000,000,000. The property of every Englishman in the time of Queen Anne was £79 per head—his property was at least £249 per head in 1882. So that whether you look at it from the point of view of men or money (and men are far more important than money, whatever the importance of the latter may be), I say that anything

that Englishmen could undertake to do in the time of Queen Anne, the people of the United Kingdom can very well undertake to do in the time of Victoria (applause).

Gentlemen, the next campaign, 1706, was started in this wise: Villeroi was near Louvain; Marlborough came to Bilsen; he gave out that he would come down and take Namur—he knew perfectly well that Villeroi would try to stop that; accordingly Villeroi, as Marlborough came down in a southern direction, marched in south-eastern direction. This again was a deliberate stratagem of Marlborough's; there was no greater master of ruses and stratagems than Marlborough since the time of Hannibal, even if Hannibal himself were as great a master. The result was a collision on the field of Ramillies. Now, gentlemen, you have before you there but a very effective, tangible result of our success at Ramillies (*pointing to a gun*). I have no doubt that some officers will be able to describe this piece of ordnance more exactly in the discussion. The French took up an exceedingly bad position at Ramillies, what is called a circular position; their line of communications, as you will see on the big map, was by Jodoigne to Louvain, and they drew in a half circle like this (drawing a picture on the board); there was a little village with a marsh in front called Autre Eglise, Ottomond's tomb on the left, and Ramillies in the centre, and another little village, Taviéres, on the right. Marlborough came up as if he were going to attack Eglise; he immediately changed his movement and broke through the French front, being very much favoured by the peculiar circular position. We saw that at the battle of Blenheim he broke through the French front—we now see that at the battle of Ramillies he broke the French front he had not the least plan of attack till he saw the positions—he marched as it were to his right, he found it so strong that he made a feint on his right and also a movement to his left, not intending to do much there; he massed in the centre, and with the greatest personal bravery not only broke the centre but so threatened the communications on the left of the French that they had nothing to do but to get back to Louvain as quickly as possible. The result of that was practically the conquest of Belgium and that an English army entered into Brussels; an English army had already been at Ulm in 1704, at Treves in 1705, and now it was in Brussels, the old capital of the Austrian Netherlands: town after town fell and practically French influence in Belgium was destroyed for a time.

I have not much more to say about 1706, and if I had I would not have time to say it. Nothing very particular took place in the way of campaigns in 1707, only another very interesting historical matter—that Marlborough prevented an alliance between the celebrated Charles XII. of Sweden and the French, and directed his attention eastwards where he soon came to grief at the hands of the Russians. We now come to 1708. In 1708 another celebrated French general appeared on the scene—Vendôme. His character is so well described in Macaulay's essay on the Spanish Succession that I will not repeat it here; as my time is short. Vendôme took possession again of Ghent and Bruges and was threatening to take Oudenarde when Marlborough marched across the river Dender

from Brussels, as you see on the map, past the river Scheldt, north of Oudenarde, attacked the Duke of Burgundy and Vendôme at Oudenarde, utterly routed them by almost making a semicircle round them, and drove them back by Gavre to Ghent and thence to a position on the Bruges and Ghent canal at Lovendeghem. Thus by another very striking advance against another distinguished French general, and a good strategic plan followed by effective tactical strokes he was able to enter into France itself. I said at the beginning Marlborough never failed, and we now see Marlborough at one of the greatest sieges of history; he went now to the siege of Lille. A map of the siege of Lille is before you. Lille was the master-piece of Vauban. Now Vauban's system of engineering I do not propose to discuss; and if I did discuss it not much attention would be paid to what I said on the subject. I am sure there are plenty of engineer and artillery officers here who can, if they please, give us some information about this master-piece of Vauban. Lille was invested by Eugene and covered by Marlborough, and the French made continued efforts to raise the siege. They had 110,000 men, but they were never able either to cut off Marlborough's supplies or to raise the siege (*see* Appendix).

Gentlemen, a very important matter in tactics in which problems are constantly set in convoy action. The first great convoy of this time—the first of the two convoy movements in connection with the siege was the march of the siege-train from Brussels down to Lille itself. That was a very remarkable event in logistics and was the subject for much admiring comment throughout the eighteenth century. The allies brought in the face of a very strong enemy, 3000 wagons and 16,000 horses and 90 guns, extending sixteen miles, and for about 70 miles safely in spite of the threats of a strong hostile force. I put up the various distances in these campaigns on the wall, and I have no doubt that they will appear in print in due time. The next convoy action was when the allies lost the command of the Lille and Brussels road through the overwhelming numbers of the French. The English having command of the sea had their base everywhere; accordingly they had to get supplies from Ostend, but the French army was there on the Bruges-Ghent canal. That led to the action called the convoy action of Wynendale in which General Webb managed, notwithstanding the efforts of the French De La Motte, to break through and bring supplies and troops to the besiegers. I have not the least doubt that some of the tactical authorities here can take part if they please in the discussion on the action of Wynendale, and therefore I omit its details, but they are most valuable lessons even now. The next great siege was Mons in 1709. Lille fell in 1708.

Now there is no country more recuperative in its resources than France. At the beginning of 1709 there was misery of the acutest kind, famine, financial difficulties and military depression, but the allies were too severe in their terms, and France rose to the occasion, equipped another army under Villars, who moved from Le Quesnoi towards Mons, which the allies were besieging. That led to the battle of Malplaquet. This battle of Malplaquet was the most sanguinary battle till the battle of Eylau in East Prussia in 1809, 100 years later; it was

SIEGE OF LILLE, 1708.

PRINCIPAL INCIDENTS.

Aug. 6-12. Skilful movement of the great convoy of siege material, 12 miles long, from Brussels to Hechlin.

Aug. 22. Ground broken.

Aug. 23. Magdalen cutwork on the East carried.

Aug. 29. Attack on Mill near St. Andrew Gate.

Sept. 9. Hornwork carried at a loss of 2,000 —very severe action.

Sept. 21. Attack on demi-bastion by Prince Eugene.

Sept. 28. Webb's successful convoy action at Wynendale.

Oct. 21. Final bombardment commenced.

Oct. 23. Town surrendered. French hold out in Citadel.

Nov. 8. Batteries able to open fire on Citadel.

Nov. 16. First covered way taken.

Nov. 23-28. Elector of Bavaria's counter attack on Brussels, foiled by Marlborough's able manœuvres on the Scheldt.

Dec. 8. Citadel surrendered.

Prince Eugene commanded the investing army about 40,000, and Marlborough the covering force about 60,000. Maréchal de Boufflers commanded the garrison 15,000 strong.

French loss 10,000, allied loss 12,000. Lille was the masterpiece of Vauban. Burgundy, Vendôme and Berwick had about 110,000 men who might have raised the siege, but for Marlborough's strategy. T.M.M.


PLAN
de la VILLE et CITADELLE
de
LILLE
A. Attacque droite
B. Attacque Gauche
C. Premier Paralel
D. 2e Paralel
E. Comn au Paralel
F. Comn au 2e Paralel
G. Comn pour le 3e Paral.
H. Chapelle qu on a Empe par asseau
I. la Bresche
K. Batterie de 7 Piesces qui a tiré sur la Maison Fortifie
L. 1 Paralel de l'Attaque Gauche
N. 2e Paralel
O. 3e Paralel
P. 4e Paralel Comn
Q. Comn des Paralelles
R. Moulin Fortifié
S. Maison Fortifié
T. Pont de Communication
V. Epaulement pour la Cavallerie
W. Redoute ou les François son encore
X. Paralel qu on doit encore faire.
Faubourg des Malade
Faubourg Notre Dame
Tour a Chaux
Porte de Fives
Porte de St. Maurice
Grand Place
Petite Place
Citadelle
Brasserie de l'Espinette
P. de St. Andre
Chateau Bouchin
Porte de la Magdalaine
Chapelle de la Magdalaine
Chemin de Menin
Chemin d'Ipres
Epaulement pour la Cavat
Batterie de 3 Piesces de 12 tt.
Batterie de 14 Pieces a 12 tt. pour empecher les sorties des Ennemis
Sence de Crencau
Y. les traverses opposées au passage ou Chemins tendant a la Ville pour empecher que les rües ne soyent enfiletés.
PLAN Der Stadt en Citadelle van RYSSEL

A la Haye, chez I van der Kloot, 1729.

a case of sheer hard fighting; there was a wood on the French right, Laniere, an entrenchment near the village itself in the centre, and a wood on the French left, Taisniere. General Withers was on the allied right, Marlborough and Eugene in the centre, Orange on the left. You see the whole line was attacked, but the left attack was the threatening turning movement. Whereupon the French commander detached from his centre to the left (all these movements were set forth on a black-board). The result was that Marlborough forced the centre with tremendous havoc in spite of the bravery, not only of Villars himself, but of another veteran French officer, the celebrated Boufflers. Mons fell soon afterwards. This, gentlemen, is the last of the four immortal victories in which English soldiers, at the beginning of the eighteenth century, planted the standard of St. George, to some effect, amongst the numerous hosts of their ancient enemies led by their most skilled and trusted chieftains.

But party spirit now began to replace wisdom and patriotism in English politics. I will not relate Sacheverell's case and the subsequent electioneering turmoil. Gentlemen, I do not object to party. You must not imagine anything of the kind; but I object to either party men, or indeed any politicians intruding themselves into the sphere of military action. As to party, I just make as much row at an election as any other man. I do my level best to promote the success of the cause which I have the honour sometimes of being allowed to champion; I think it a good cause, but supposing that a general who won a battle happened to be of the opposite party, would it not be carrying the spirit of party to the utmost baseness to refuse honour to a leader who had saved his country simply because he did not walk across with us from one lobby of the House of Commons to the other on a occasion of mere local and temporary importance? The successful party now determined to ruin Marlborough, but before they had ruined him, he had ruined Villars, and he very nearly managed to get into Paris. His schemes in 1709 and 1710 were of the utmost daring —far in advance of his age. He wanted to mass his troops and force or mask the northern line of French fortresses, and to march straight on Paris. He was prevented by the Dutch; but Villars, fearing this manœuvre, constructed the *ne plus ultra* lines, and these will practically be also the *ne plus ultra* of my claim upon your patience this evening. They stretched from Namur to Calais; an enormous line it was. I hope some gentlemen will discuss these lines and their military value; I believe these lines in no respect resemble the lines of Torres, Vedras and such like; but that we shall see later on. Marlborough forced these lines—which were protected by the most able Frenchmen and a very gallant army and by all the chivalry of France, fed by the sale of the jewels of the ladies of France. Marlborough resolved to take Arleux, not because he wanted to take it, but because he wanted Villars to think that he regarded it as of special value. Accordingly he made desperate efforts to take it and succeeded and began to fortify it, but Villars recaptured the posts. Marlborough then made a flank march along the lines to the left as if he were about to carry the position of Montenancourt.

He lost his temper for once in his life; he was a man of perfect temper, nothing could disturb his calm serenity of soul, and he had some interesting and exciting domestic causes that would try most people's temper, into which I have not time to enter this evening, but on this occasion he positively displayed almost childish petulance—he reconnoitred the lines near Villars-le-bois direction, rode up to them and appointed the places for attack. It so happened that at this point they were almost impregnable, whereupon Villars closed up to his own left, and Marlborough, to deceive, placed his own army in touch with his and issued orders for an engagement to the amazement of friend and foe alike. But after completely misleading the French he sent Cadogan, August 4th, with a considerable force to join Hompesch from Douay, and together they crossed the causeway at Aubanchoil-am-bac about 3 a.m. They were within the enemy's lines with no loss, after them came the main body of the allied army. It made a rapid night march, and by 5 a.m., August 5th, reached the banks of the Scarpe, near Vitry, passed by pontoons, and by 8 a.m. reached Aubanchoil. Villars followed hard after them and drew up in line of battle on the 7th, but Marlborough again passed the Scheldt and invested Bouchain, which fell September 12th. This whole manœuvre was master-piece of strategy and ruse. As this flank march was the very finest display of a flank movement, and a turning movement combined, and an admirable example of a successful movement by night, I hope the Secretary will allow me to describe the lines and the movement in an Appendix. Thus the *ne plus ultra* was broken. Whereupon Eugene, who was absent, wrote to Marlborough and said you have put an end to Villars and his *ne plus ultra*. After the capture of Bouchain our hero was recalled and disgraced at the end of the year, and, gentlemen, I have practically come to the end of this lecture.

But, my Lord, and gentlemen, there is one thing that I did not refer to, and that is the question of the command of the sea, without which England is nothing at all for defence or aggression. You may say what have Marlborough's campaigns to do with the command of the sea? Well, I would not like to answer that question on my own authority merely, and accordingly I answer it on the authority of Captain Mahan. If it pleases you I can read his words: "The sea power of England therefore" (referring to this very struggle) "was not merely in the great navy with which we too commonly and exclusively associate it. France had such a navy in 1688 and it shrivelled away like a leaf in the fire. Neither was it in a prosperous commerce alone. A few years after the date at which we have arrived, the commerce of France took on fair proportions, but the first blast of Marlborough's war trumpet swept away the commerce of both France and Holland; it was in the union of England's navy and its commerce, and its army carefully fostered that England made the gain of sea power over and beyond all others, and this gain is distinctly associated with and dates from the war of the Spanish Succession" (that is to say from 1702 to 1713, the period of Marlborough's campaigns). "Before that war England was *one* of the sea Powers; after that war she was *the* sea Power; this power she held alone unshared by friend and unchecked by foe." Therefore,

gentlemen, the command of the sea and the victories of the army must be regarded even at such an early date as inseparably associated, and in an Empire like ours, with such enormous territories, what is the use of arguing whether the navy or the army be necessary or not? The one is the complement of the other, to use a mathematical term, and it is just as absurd to argue about their relative utility as it is to discuss whether in a well-regulated family the wife or the husband is the more important factor (applause).

My Lord, and gentlemen, I will just for a moment direct your attention to a map of the British Empire, a map which should hang in every club-room and school in our land, and I will show the extent of the Empire at the close of the war of the Spanish Succession and its extent now. Well, the British Isles were then, as Milton said, "the noblest and the best of all the main;" they were there so then and they are so still, and I hope they may for ages remain noble and great—that depends on the spirit and knowledge and physique of their inhabitants. In India we only had territory at Bombay, but trifling in extent and wealth compared to our present presidency; in the Mediterranean we had Minorca, which we have lost since, but Malta has taken its place; we obtained in the war, Gibraltar, and I hope we will continue to retain Gibraltar, too, in spite of everyone. May the shades of Queen Anne and of Marlborough, and of Elliot and Howe, Nelson and Collingwood for ever hover like the ghost of Banquo at Macbeth's feast over the head of any officer who wishes to evacuate Gibraltar. We had Jamaica and we had Newfoundland and Nova Scotia. Now, gentlemen, just look at that picture in 1713 and look wherever the red colour is on this other map of Empire. Marlborough was one of the founders of the vast Empire which you must defend, an Empire boundless as that sea to which Mahan has so eloquently referred; an Empire "iceing the pole" in America, "and in the torrid zone, dark heaving" in India. Gentlemen, it is the duty of us all to follow in the footsteps of Marlborough and to devote all the energies we have, and, if necessary, our lives, to preserving our Empire and its centre, those two right little tight little islands:—

"Great, glorious and free,
Fairest flowers of the earth
Brightest gems of the sea."

(Applause).

DISCUSSION.

The Chairman—Gentlemen, the Secretary informs me that he has a letter which will be of general interest to you all to hear—he will read it.

Major Abdy—The letter is from Mr. Charles Dalton, the compiler of the Commission Register dating from James II.—he is one of our honorary members—I am sorry he is unable to be here to-night. He writes as follows:—"If Dr. Maguire can throw any light on the missing Marlborough Commission Registers," etc. (*reading the same*). I do not know whether Dr. Maguire can give us any information upon that point. Perhaps Lord Wolseley can.

Dr. Maguire—I am afraid if I ventured to give any information I should be drowned in that "yawning hiatus" referred to in the letter. I do not know a single thing about it.

The Chairman—Then I will call upon Colonel Rainsford-Hannay, who has kindly consented to speak on the subject which has interested us all to-night.

Colonel Rainsford-Hannay—My Lord, and gentlemen, if I venture to thank Dr. Maguire for his very excellent lecture I shall do so as the representative of what I consider is a numerous class of officers who have not, for various causes into which it is unnecessary to enter, studied history, but who are all ready to receive information when we can get it without much trouble to ourselves, and more especially when it is given us in the splendid manner in which Dr. Maguire has given it to us to-night (applause).

I have been looking up some books that the Secretary of the Institution has kindly lent me, and in them there are most interesting records of Marlborough's and Eugene's battles; the prints are very fine, and there are also plans of the various battles; but it is very difficult to see really what part the artillery took in these battles. You see that they did take an important part—you see the guns are put down upon the plans, and you see in every siege and battle there were several guns in action. But the plans are wanting in scales, and there is really no detailed account of what the artillery did. I should therefore like to ask Dr. Maguire whether he can give us any idea of the organization of the artillery at that particular period, of the ranges of the guns, and of Marlborough's system of parking them. On the table before us there are various guns that formed part of Marlborough's ordnance equipment, guns from 3 lbs. up to 24 lbs., and I think there are 8-inch and 15-inch howitzers. There are also scaling ladders and pontoons which are part of the engineer equipment now. There are also kettle drums, and I believe the covering of those very kettle drums is now in the charge of the Senior Store Officer at this station. But what I particularly want to know (and I think it would interest many officers here) is something of the performances of the artillery in these sieges and battles, because the more we study the part the artillery takes in these various wars the more I think we shall feel that in artillery development we are keeping our place and advancing *pari passu* with other arms, and that in our organization, and in our training, and in our equipment we are holding our own—aye, and more than holding our own—as an important factor in the arbitrament of battle.

The Chairman—I now call upon Colonel Maurice.

Colonel Maurice—Really I do not think there is anything to be said about the lecture. It seems to me it was a most interesting exposition, and it has been so clear and so simple that I do not think we can do better than leave it to its own effect upon this audience, who, I am sure, have appreciated it most thoroughly.

Dr. Maguire suggested that I should say something about those long continuous lines of defence that he has put on the board there; but it seems to me that he showed in the clearest possible way what their weakness was. He showed in the first instance the enormous extent of the line stretched across France and Belgium, and he has shown the mode in which Marlborough imposed on Villars and passed him. I cannot see that it can be much improved upon by anything that I could say on the subject. It is certainly interesting to contrast the peculiar weakness of that long line, which was there traced as Dr. Maguire has given it on the map, with the very different kind of weakness which I think most soldiers now-a-days attribute to the yet more elaborate and more costly line which has been traced by France in our own time. I take it that the weakness of that particular line was simply what Marlborough showed—that he had only to attack

it at some selected spot and there to break it. But the weakness of the great French line, which has been more or less discarded by the French now, in the original arrangement of the defence of France after 1870, does not lie in that direction. The character of armies as it was in that time has in our own changed in this respect: that whereas in those days no army which could be gathered could possibly have occupied that front through which Marlborough broke or anything approaching to it, in our time armies are so enormous that even that whole length of front, which has been fortified at the cost of milliards on the frontier of France, would be occupied by French soldiers from end to end as nearly as possible, only that in order to occupy it they have to get there; and the difficulty in our time of any such operation becomes one rather of the movement of troops by railway, and the concentration of forces for that purpose, and all the rest of the huge problem involved in getting the troops there and maintaining them, rather than the particular difficulties that presented themselves in this case of the defence of France on that long line. So I do not think the analogy in that instance is as close as that of many other of the points to be learned from Marlborough in their bearing upon our own time. I am sure that it is of the greatest value to us as soldiers to get those points brought out which are still applicable to modern war. Lord Wolseley will be able to draw out for us the lessons which he has himself exhibited before us in our own time, and which are more closely analogous to those of Marlborough than of any other general. I speak especially of the questions of ruse, the concealment of design, and imposition upon the enemy, as to what is intended and so on. I think if we can only induce him to talk about these we shall have done a great deal more towards the practical application of the experiences of Marlborough's time to our own than we could in any other way.

Major R. H. Murdoch—My Lord. Considering that England's only general and professional commander-in-chief under the Queen, Anne, never attempted any operation of war, small or great, without having first on the ground a due complement of artillery, it may seem a reflection on artillery records that details of the constitution and services of the artillery of Marlborough have never been published. The fact is that these details do exist in entirety; but they are buried—partly in the Public Record Office in Fetter Lane, and partly in the family archives at Blenheim Palace. Now, as Marlborough's adjutant-general was an artillery officer—Brigadier Jacob Richards—there must be in the Blenheim *MSS.* artillery reports and details of the most essential interest. No one can properly utilise the artillery records in the Public Record Office unless they are collated; and as these are highly technical and professional, the civilians in charge have not attempted the work of collation. Having, however, for some years been a volunteer pioneer in these matters, perhaps I may be permitted for five minutes to give an outline of the results of my researches.

First: with regard to *Siege* Artillery. This consisted of "whole cannons" or "cannons of battery," whole culverins, 12-pounders, mortars and hawbitzers (howitzers). These were all of English manufacture, as Marlborough would not employ foreign guns with British troops—preferring the sounder material that he got from England. The "cannons of battery" were to batter the walls of fortresses, and were what we would term "40-pounders"; the "culverins" or 24-pounders cut out the portion battered for a breach; while the 12-pounders repressed sorties.

Marlborough's *siege* campaigns may be divided into two classes—those which were *artillery* sieges proper; and those which subsequently became *engineer* sieges, conducted alike by the artillery. Until Louis XIV. issued a decree—which was repeated by the Republic, and also by Napoleon—binding the governors of places to stand at least one assault, it was the custom, as soon as a practicable

breach had been made, for the garrison to surrender. This accounts for how Marlborough in the 1702/3 campaigns was able to carry all before him, on the Meuse and Maes, from Venloo to Huy, completing four successful sieges in almost as many months. He had to cover the besiegers by his army until a breach 25 feet square had been effected; and the army being in position for assault, the honour of the besieged was then satisfied, and the garrison surrendered with the honors of war.

Ricochet fire was then unknown as such, and the enemy's ordnance was seldom dismounted.

After the decree of Louis we find, in general, regular or *engineer* sieges. Then parallels had to be formed, with the horrible mine and counter-mine warfare. I may here say that all Marlborough's ordnance, siege and field, was solely of brass (bronze); and that Monsieur de Saint Rémi, a contemporary of Vauban and of Marlborough, tells us that culverins at 300 yards took many days to make a breach—although the English broke ground at 500 yards except when they had to resort to the inferior Dutch powder.

We have a special illustration of the magnitude of a siege-train in the instance of that remarkable march of the convoy from Brussels to Lille, 1708, which Dr. Maguire has so lucidly explained this evening. This train comprised 90 pieces of ordnance, also 60 mortars up to 15 inch, 3000 ammunition wagons, 15,000 horses, and extended 15 miles in length; yet arrived before Lille without the loss of a single wheel! (The 60 mortars were for firing in volleys of 30).

Now, with regard to *Field* Artillery. When we do have the history of the artillery of Marlborough brought to light, it will revolutionize all received opinions of the actions of his era. In that wonderful march of artillery, possibly unprecedented, from the Meuse to the Danube—which the Lecturer has sketched—in the terrific heat of July 1704, the Field Artillery train marched 24 miles per diem, although it consisted of demi-culverins or 18-pounders, 12-pounders, sakers or heavy 6-pounders, and cohorns; and on the day of arrival fought in the memorable victory of *Donawert*. And when we can rightly comprehend the still more glorious battle of *Blenheim*, in August, we shall have to alter all our preconceived ideas of the organisation and fire discipline of the Field Artillery of that period. It was owing to the masterly manner in which Colonel (afterwards Brigadier) Holcroft Blood, who commanded the 60 pieces of English and Hessian artillery against the French right, availed himself of the order of the commander-in-chief to post his guns at discretion on the ridges, to the splendid intuition of Marlborough that upon the corps artillery would depend the issue of the day, and to the excellent practice of our gunners, that, on the 100 guns of the French right being at last silenced, after our brave and devoted infantry had been twice repulsed, Marlborough himself led on his re-inspirited infantry and cavalry—with their battalion 3-pounders and 1½-pounder gallopers—to the third and successful assault which consummated his own glory and the *moral* of the three arms.

The curiously wrought trophy gun, now before us, and to which the Lecturer has alluded, is not a weapon of war but of triumph. With its vent common to three tubes it discharged "fireworks of triomph"—at the Tower to celebrate the Peace of *Utrecht*, 1713; in St. James's Park, for the Peace of *Aix-la-Chapelle;* in the Green Park, for the Peace of *Paris*, 1762, which closed the *Seven Years War;* and it was last displayed at the Royal Military Exhibition.

I am sorry to have had so long to interpose between his Lordship and the gathering.

The Chairman—If there is any other gentleman present who would like to say something and give us some further information upon the topic in discussion we shall be very glad indeed to hear him. There are a large number of officers

here to whom I am sure the campaigns of Marlborough are very well known, and I hope, if they have studied them, they will give us the benefit of their views.

Lieut.-General E. Markham—I should like to ask one or two questions. I do not know whether it is going too much into detail, but there are a few things we have not yet heard. We have heard about the campaigns of Marlborough, and we have also heard from Major Murdoch about the train that had this long march of fifteen miles and never lost a wheel. I think it speaks very well for the Ordnance Department of those days, and I only hope that if we should ever have to make such a march again, the Ordnance Department will be up to the occasion and up to the mark, as they were in those days. But one of the points I rather wanted to get at was this: What was about the amount of ammunition that our men carried on those occasions in their pouches; and also what reserve of ammunition was taken during this long march? It is rather an important point I think to know what they carried with them in those days.

The Chairman—Dr. Maguire, have you anything you would like to say in reply?

REPLY.

Dr. Maguire—I have very little indeed, my Lord, to say in reply. In point of fact I did not take up any matter especially connected with artillery or ordnance, and I do not know that I have any books that would have satisfied me very fully if I had tried so to do. My idea was that in the discussion all those points would be fully dealt with by artillery and engineer officers, and I really had not the presumption to come down here, even if time allowed, and parade before them any knowledge of mine in regard to such matters. But the artillery, I do know, at this epoch was formed into an arm apart and outside the army, and was not considered as a tactical unit of organization; it was left—I believe the gallant officer, Major Murdoch, will agree with me—nearly entirely in the hands of people supposed to be apart, and only on the day of battle arranged by a general. And, that being so, in not one of the books of general history describing these campaigns, are the details set forth which the gallant officer wishes to learn.

For instance here is a tremendous tome by Rousset—one of three—and I think Major Murdoch will search it in vain for the information which this gentleman requires.

In answer to General Markham's question, if I can find out exactly the number of rounds carried, as of course the value of a march or the credit due to the marching soldier depends largely on what he carries, I shall be only too pleased between now and the publication of the journal to insert such data.

With regard to the artillery I think I was lucky in leaving the matter in the very able hands of the gallant officer Major Murdoch who has made such an admirable speech on the subject.

May I say that the cavalry and infantrymen did not appear to be very much afraid of the artillery at that epoch, and even as late as the battle of Waterloo, during the tremendous showers of shells, the British infantry regarded the artillery as a kind of relief from the perpetual charges of cavalry (laughter). We find that spent balls were very common things. I know so much about the artillery as to be able to tell you that one well directed shot at the battle of Ramillies carried clean off the head of an aide-de-camp of Marlborough. Spent balls were so common at the battle of Orthes that one hit an officer, whereupon the Duke of Wellington laughed consumedly; but another struck himself immediately afterwards whereupon his laughter ceased.

A gallant officer referred to history. Now I must say, if you will allow me, my Lord, in conclusion—and it is not because it is my particular province to

deal with history that I say so—that I really believe it is perfectly disgraceful to find the great majority of the ingenuous youths of England, whether they are poor men's sons or rich men's sons, without the slightest knowledge of the conditions of our national existence. I think it is a positive danger and no such educational absurdity is possible in any other civilized country. I wish some person in authority would try to remedy this evil. I was once on an electioneering campaign, and I was talking with a candidate—a man of high position—before the meeting; he thought that Ligny was a place near Belfast, and he had not the slightest notion of the circumstances under which the younger Pitt brought about that Union concerning which he very rightly went into rhapsodies.

I have no more to say, my Lord, and gentlemen, except to thank you for your kind reception of my lecture.

The Chairman—(who on rising was greeted with prolonged applause).

Gentlemen, in common, I am sure, with everybody present, I have listened with great interest to this lecture. It is upon a subject of which I know a little, but it is a very big subject, and I am lost in astonishment at the Lecturer being able to convey, as he has done, in the short time he was on his legs, so much information upon it. The period referred to embraces ten years of continual warfare, not a ten years in which there was an occasional campaign here and an occasional battle there, but in each year of that great decade of glory for England, there was a glorious campaign. To attempt to deal in anything like detail with any particular battle would be quite impossible, to me at all events. But the Lecturer has done so as regards two or three of the great events of Marlborough's wars. He has done so very lucidly, and has conveyed a considerable amount of information to us.

We have much information upon a great number of the world's battles in what I may style the classical period, and know much of some of the greatest sieges of antiquity. Who, for instance, does not know something about the siege of Troy—yet most of us know little indeed about Marlborough's campaigns or sieges. I am sorry to say this, but it is the fact, there is a great paucity of information in English history about his wars, looking at them from a military point of view. You will find volumes in libraries upon the political points that were raised by Marlborough's battles, but you will find very little that describes minutely the campaigns that he conducted, or that enters at all into anything like a minute description of any battle that he fought during his great career. It is a great shame to us—I think the Lecturer has referred to the fact—that there is no really good book upon Marlborough's wars existing in England, and that if you want anything like a readable account of his campaigns you have to turn to the pages of that history to which the Lecturer has referred, the book published by order of Napoleon—I think it was in the year 1806 and not in 1809 as the Lecturer said.

Now I will tell you a curious thing about the publication of that book, a work which I recommend you all to read. It is a very readable book and describes Marlborough's campaigns in an admirable manner. In the year 1805, as you all know, Napoleon had a big camp at Boulogne when he, I think I may say, certainly intended to invade England. I know this is a moot point that has been raised more than once by historians and by people who wish to make out that an invasion of this country is an impossibility. Many books have been published to prove that Napoleon never did intend to invade England, but I cannot imagine any dispassionate reader of history who will take the trouble to enquire into the circumstances which took Napoleon to Boulogne in 1805, arriving at that conclusion. I at least have no doubt in my humble mind that Napoleon intended to invade England in that year, and that he was only prevented doing so by the glorious victory won for us by Nelson at Trafalgar. Now it is interesting to

remember, apropos of that time, that Napoleon was a man who always had a card up his sleeve. I don't think that during any of his many wars he ever embarked upon any campaign, or I may say on any battle, where he was not prepared for a complete volteface at any moment. If he found that he was stopped from carrying out his original intention he was always prepared to adopt an entirely different line of advance or operation on the spur of the moment. That was the case in 1805. He knew there were difficulties and dangers and a great many chances that might prevent his invading England, and he had a great and very just horror —and I hope all nations may continue to have it—of the English navy. He magnified and almost exaggerated our power on the sea, and he felt that he might be thwarted by our navy in his great aim, the invasion of England and the capture of London. So the card that he then had up his sleeve was a great march across the centre of Europe from Boulogne to Ulm, where, as you know, he captured a large Austrian army under Mack. During the time he was engaged in drilling his troops and accustoming them to embark and disembark at Boulogne, he was reading very carefully all the information he could find regarding the march of an army across Europe similar to that which he then contemplated. It was but natural that he should turn to the great march made by Marlborough to almost the identical point of the Danube which he himself subsequently struck. He studied it most minutely, and we know that he got from the archives of Paris all the information that those archives supply—and they are most voluminous—regarding this march. Having done so, and being immediately struck, I presume (this is a thing I cannot tell you for certain) by the great ability, soldier-like skill and strategical talent of Marlborough, he gave orders for the writing and publication of the book to which the Lecturer has referred—a book which I recommend to all those who wish to learn anything about Marlborough's wars. Those who read it will find there a good description of Marlborough's celebrated march, and if you will compare that march with Napoleon's march from Boulogne to the Danube, you cannot fail to be struck by the similarity of plan followed by those two generals in their two separate operations. It is a curious coincidence.

I will tell you another thing—it is merely a small point in connection with Napoleon and Marlborough. The careful reader of Napoleon's conversations at St. Helena must be well aware of the high opinion he entertained of Marlborough's abilities as a general and especially as a strategist. He spoke of him several times as *the* great man and *the* great general; but such was his hatred of England, such was his narrow-minded prejudice against England, that when he advised students of history to read the great campaigns of the greatest generals, he specified Alexander the Great, Hannibal, Cæsar, Turenne and many others, but carefully left out the name of the great Englishman, perhaps I might say the greatest Englishman, certainly the greatest soldier, that England has ever possessed. He left out the name of Marlborough, although in his heart he believed him to be one of the greatest generals that ever existed.

The study of Marlborough's character, of Marlborough's proceedings, and of Marlborough's education, is most interesting, and is a subject to which I have naturally turned my attention at odd times for many years past. I intend at some time or other to write an account of his campaigns (applause). The more you read, the more you learn of the man himself as he is revealed to us in his letters to his wife, never intended for any eyes but her own, the more astonished you become at the difference between the man as he really was and as he is usually represented by English political writers. From these letters you are able to get hold of his inner mind. There are few contemporary histories that tell you much of the man himself, but from the enormous correspondence that he left behind him you can learn much about himself, his ideas, his aspirations, and his mode of carrying on war. I shall not attempt to recur to his early days further than to

refer to one topic that has been mentioned by the Lecturer. He referred to the study of Latin, and to the great misfortune it was that English people did not study history more than Latin. Now Marlborough knew Latin tolerably well, and as a boy he turned that knowledge to account by reading Vegetius, from whose pages he obtained a good knowledge of the art of war in classical times. In his case at least a knowledge of Latin served some good purpose. Apropos of the question now talked of a great deal in educational circles, as to whether the young gentlemen who go up for army examination should know anything of Latin or not—on the one side you have all the great head-masters of the English public schools, who tell you there is nothing like Latin, and on the other hand there is another, perhaps I may call them a more advanced class of instructors, who tell you it is great folly spending hours or months or years of boyhood in pouring over Latin which can be of so little use to you in after life. But I will tell you a curious little circumstance that occurred to me the other day. I do not mention it for the purpose of crying up the great advantage of knowing Latin, for I think the question at issue is a difficult one to decide. I was lately anxious to obtain information about a man whom the Lecturer referred to once or twice this evening, Heinsius, the great pensioner of Holland and a trusted friend of Marlborough during all his wars. Next to Marlborough, he was, I think, the most remarkable man in Europe of his day, and one of the greatest statesmen that Europe ever produced. I looked in encyclopædias, and they told one the usual conventional things, when he was born, how many children he had, and when he died; beyond that I learnt very little. At last I wrote to a friend in Holland, and he said that the only work he could refer me to was a Latin book, which he sent to me. I poured over it and—with the greatest possible difficulty, I need scarcely say—I made out what I wanted. If I had not had during my boyhood a considerable knowledge of Latin I could not have done this.

If I were asked to institute a parallel drawn from ancient history between Marlborough and the great leaders of classical times, I should be inclined to describe him as the Hannibal of England. If you study his system of strategy, I do not know any man, except Napoleon—who came after him—whose strategy resembled Hannibal's more than his. It was always a grand offensive strategy. His strategy marked a new departure in the conduct of war. His opponents were the great generals of Louis XIV., who still adhered to the old-fashioned policy of defensive lines—regarding which we have heard much this evening from the Lecturer—great lines which were always weak because of their enormous length. It is an interesting fact that during the whole of Marlborough's campaigns he never resorted to those lines himself, and that he invariably took them when they were made by his enemy. From first to last his policy was strictly and purely offensive. Napoleon was, I think, the greatest master of the offensive that the world has ever produced, but he came after Marlborough, and I have no doubt whatever in my own mind that, great as was his own intuitive genius for war, he derived a great deal of information from the study of Marlborough's campaigns, which study he himself initiated in France. At the same time—as was the case with Napoleon—it is difficult to say whether Marlborough was greater as a strategist or as a tactician.

The Lecturer naturally singled out the battle of Blenheim as an illustration of Marlborough's great tactical powers, and the more you study it the more you gain information as to his absolute coolness under fire, you will find that in the midst of a very noisy battle such as Blenheim was from the time it began till it ended in the evening, he was calmly self confident. Throughout the battle he took part in some of the cavalry charges himself, but notwithstanding this fact, he never for a moment lost sight of the great tactical points, whose possession he

knew would secure him victory. The tactics he adopted in order to obtain possession of those decisive points are beyond all praise and are worthy of the most careful study. I have no intention of going into or describing those tactics; no doubt they are as well known to most of my hearers as to myself; but there is a point which the Lecturer a little glossed over when he was referring to the battle of Blenheim, and that was the folly, the great tactical error, committed by Tallard in blocking up a very large body of men, a whole division, in the village of Blenheim. When subsequently he was most anxious to withdraw them from it, he found it impossible to do so owing to the tactics pursued by Marlborough. This was really one of the chief causes which led to the complete overthrow of the French upon that occasion and which enabled Marlborough to win the battle. Leaving the village of Blenheim on his left he pierced the centre of the French army, cutting it in two and hopelessly separating its two wings, became master of the position, and compelling at last the surrender of this large French force that Tallard had foolishly locked up in the village of Blenheim.

The Lecturer referred to the parallel between Blenheim and Waterloo, and told you that the positions were reversed. So they were in many ways, but it is an interesting study to consider that parallel. He has also told you that Marlborough nearly fought a battle on the plains of Waterloo. It was very nearly coming off; but you must remember that it would have been an entire reversal of what took place on the 18th of June, 1815; that is to say, Marlborough would have been in the position that Napoleon found himself in at Waterloo, and the French would have occupied Wellington's defensive position; Marlborough would have been the attacking party coming from the south as was Napoleon's case in 1815.

There has been much reference to the artillery of Marlborough's day. If I were asked who created the artillery as a separate arm, the Royal Artillery to which most of you belong, I should say it was Marlborough. He was the first man who recognised the necessity of making it a separate and independent arm. Previous to his days the artillery occupied a rather unimportant position in our armies. It was not that he altered the nature of the guns, because the guns that he used—I say so with all deference—were the same guns as were used for a long time previously; they were the same guns as were used by William III., and so far as I know, even in the reign of Charles II., and I think they were mounted on the same carriages. But it was he who, I will not say, created the artillery, but who used his field guns in action in a new manner and in a fashion which in a great measure led to the development of the Royal Artillery as an independent corps. It is curious to note that the guns of those days were largely used for high-angle fire. I think you will find that before long we shall also use that sort of fire very commonly in the field. Marlborough used howitzers to a large extent in the field, and in some cases he even used mortars. But howitzers were largely used in all the great battles of the opening years of the eighteenth century.

As the material of war then made use of, it is very interesting to see what a very conservative people we are in war as in all other respects. I am glad to notice what the Lecturer told us, that Marlborough always used English material, and I hope we in our turn may always do so also. But our models came from France; we were not an original people in the art of military appliance in those days any more than we have been lately. I think that the great curse of the English army for the last 200 years has been, that we have always been content to copy guns and war material as well as drill from some other nation. We want the self-assertion to strike out a line for ourselves. Gentlemen, I hope those days are gone. I believe in the ingenuity of the English people first of all to make us the best material, and to invent us the best guns, and I look to

the great corps of Royal Artillery to turn it to the best advantage. They know what is required better than others, and I am sure that if they are given a free hand they will be able to point out to us the way which we should travel on the path of progress in the matter of guns, and enable us to have the best guns in the world, so that we may have other nations copying us, and not we copying them servilely, as we have done for so long.

There was another service created by Marlborough which may not be so interesting to you all, I mean the commissariat service. This is a point that few connect with the name of Marlborough. The Duke of Wellington said that many a man could command an army in battle, but that very few could feed an army as well as he could. Marlborough shewed the actual importance of the commissariat service by attending to the question of supplies as if he had been educated all his life as a man of business. He organised a system of supply and selected men to be responsible for it. The more you study Marlborough's wars and go into the minutiæ of his campaigns, the more this point will strike you.

As to the implements of war used in his day, you have such good models here that you require little further information about them. But if you do wish to know more on this point you can find it in Blenheim Palace at the present moment. There you will find some magnificent tapestry pictures of the principal battles and sieges engaged in by Marlborough, and around those pictures, which are very large ones, there is about eighteen inches of margin on which are represented, mostly full size, the implements of war of that day. It is quite curious to see how little they are changed even at the present day. Down to the very tent-pegs they are exactly the same pattern as those now in use. Your guns have altered in shape and dimensions, but there you will see the old gabions, the old fascines, the same old mortars and interesting tools that we were accustomed to in the trenches before Sebastapol. Even the old familiar blue wooden water-barrel that we were then cursed with and had to carry about us with its very sharp iron hoops bruising our hips as we walked or ran, there you will see it on the pictures on the walls of Blenheim Palace.

As I have already said, the Lecturer has very naturally selected the campaign of Blenheim to illustrate Marlborough's strategical genius. Blenheim is commonly recognized as one of the fifteen decisive battles of the world, as the Lecturer has reminded us. Creasy's work on those great battles is an admirable one for anybody who is lazy and wants to know something of the great events of the world. But if I were asked to advise young officers as to the campaigns they should study for lessons in strategy, I would certainly not omit Marlborough's campaign of 1702. It was the first campaign that Marlborough made in his great decade of glory, and although no battle took place then, it is full of interest and strategical lessons. In 1704 he had already done so much that the Dutch were inclined to trust his judgment, and accordingly he had already achieved some fair share of power. But in 1702 he had very little influence and still less power. Throughout that campaign he was held back by the Dutch deputies, the Dutch people and the Dutch ministers. They had as yet no reason to believe in his military genius or to trust his judgment. The Queen had made him a Duke, and he had won some small minor actions in different parts of the world, and distinguished himself as a young man under Turenne. When very young, his brave conduct at the siege of Maestricht had attracted attention. But he had done nothing as a general in Europe that would justify the Dutch in following his advice in preference to that given by their own commanders, several of whom had held important commands in the field. It was but natural they should turn to them in preference to taking his advice. The result is, that you have in this campaign of 1702 the best illustration of the difficulties he had to contend with in dealing with timidly cautious generals and stupid ministers, who imagined they could teach him a

science and an art that he knew, not only from study, but I may say intuitively also. If you wish for an illustration of the strategy which Napoleon afterwards illustrated so grandly, throughout his life, do read Marlborough's campaign of 1702. He started from a place called Nimeguen, celebrated for its treaty. His plan was to suddenly cross the Meuse and by marching south, compel the French to abandon the position they occupied on his left higher up that river. It would require a large map to illustrate this campaign, and therefore I shall not attempt to do so; but it was most successful from beginning to end, although Marlborough was kept back and restrained by stupid deputies and dull and jealous Dutch generals who did not yet believe in him and would not consequently take his advice. The campaign ended in some remarkable sieges on the Meuse of which you have just heard.

The Lecturer has referred to Marlborough's power of obtaining information, and he also spoke of his being master of ruses in war. I do not think there ever was a man who did so thoroughly and completely understand the science—for it is a science—of deceiving his enemy as he did. He always began by deceiving his friends. In other words, it became in his day a maxim that has come down to us, that if a general in command of an army wishes to deceive his enemy, his first aim should be to deceive his own staff, his own aides-de-camp, and even the generals around him. The moment he trusts anybody and tells anybody what he intends to do, the chances are many to one that somebody else will know it. When two people know of any projected plan, it ceases to be a secret. That was evidently Marlborough's opinion. On one particular occasion to which the Lecturer referred, he even pretended to be very much put out by the French having taken a certain place, although he had intended them to take it. He had expressly left the place weakly garrisoned and very badly supported on purpose that they should take it. He took them in so completely, that he went into his tent and moped there, pretending to be immensely put out, as Cæsar had done upon one occasion, following his proceedings as precisely that it almost makes one believe he had copied Cæsar upon this occasion. He carried out the deception so well that he took in, not only his enemy, but his own army, and the result was a complete success. For ever afterwards, whenever he announced it to be his intention to attempt some special operation, his announcement gave rise to a suspicion in the minds of his men that he meant to attempt the very opposite. It is a capital matter of first importance to leave your enemy so much in the dark that he does not know what you are about or where you mean to strike. The moment you have achieved that result you have obtained over him a great moral superiority that gives you a great advantage before you have even fired a shot.

Gentlemen, I have referred to all the different points I noted down as the Lecturer proceeded. I have listened with great interest to Major Murdoch's statement and to all he told us about the guns used by Marlborough. There was a question asked as to the ranges that guns were then fired at. I think if you take a good map of Blenheim, it is easy to measure what the ranges were at which the field guns came into action. I cannot tell you right off, but I think the ranges were from 600 to 900 yards. It is a mistake to imagine that field guns did not then range up to those distances. I have recently been studying on the ground the operations during the battle of Boyne, where the guns made use of were exactly the same as those at Blenheim. I only quote from memory, but I think the extreme ranges at that celebrated battle were from 600 to 900 yards.

I have nothing more to say, gentlemen, and I feel that I have already detained you too long. Besides it would require a great amount of preparation in the way of maps and plans to enable me to enter further upon this interesting subject. But I am glad that you have had this subject brought before you by one of the ablest Lecturers we have got in England, for it will, I hope, induce

many to study the campaigns of one of the greatest soldiers we have ever had in England, one of the greatest soldiers in the world. We have every reason to be proud of him. The fact that he was fond of money ought not to prevent our being proud of him. There were then, there are now, a great many other people in the world who without being great were and still are fond of money. But is not this very common failing blotted out by the glory he brought his country? We must not forget that, had he not been hunted down by an infamous political party for party purposes, he would certainly have achieved the great object he aimed at, namely that of dictating terms to Louis Quatorze in that monarch's capital; indeed I believe he would have done so in 1703 had he been given an entirely free hand by the States General. He has been abused from time immemorial for wishing to prolong the war. I can only say that any man who will read, as I have lately done for days and days, Marlborough's private letters to his wife, will see that his one great longing was to end the war quickly and pass the remainder of his days with his wife and children. He was sick and tired of war and of all the worries it brings with it. Had he not been held back by stupid Dutch deputies, and interfered with by jealous colleagues, I think it is as certain as anything can be a certainty in this world, that he would have secured a glorious Peace at Paris in 1703 or 1704, and certainly before 1707. We should thus have been saved that unfortunate, I might almost say disgraceful, episode in our history, the Treaty of Utrecht.

I have in conclusion, gentlemen, only to convey to the Lecturer on your behalf as I do in my own name, our grateful thanks for his kindness in coming here this evening to inform us on a very interesting topic, and for the very admirable lecture that he has given us (applause).

APPENDIX

FRENCH EULOGY ON MARLBOROUGH.

"Le prince de Vaudemont, parlant de Marlborough au roi Guillaume, a fait de lui cet éloge: que la vivacité de Kirk, la conception de Lanier, l'habileté de Makay, et la bravoure de Colchester, sembloient réunies dans sa personne. On a dit aussi de lui, que dans un seul jour il avoit mérité plus de réputation que d'autres dans un grand nombre d'années.

Dans la distribution des emplois, il avait moins d'égard au grade militaire et à l'ancienneté qu'au mérite. Les officers subalternes, dont il savait deméler le talent dans leur obscurité, n'avaient besoin, pour s'avancer, ni d'intrigues, ni d'un grand nombre de campagnes. Ce que nous appelons l'ordre du tableau, étoit, selon lui, le tombeau de l'émulation. Jamais guerrier ne jouit mieux de tous ses avantages. On ne pourrait pas dire de lui ce qu'on disait d'Annibal, qu'il *savait vaincre mais non profiter de la victoire.* Marchant de succés en succés, chaque pas qu'il faisait en avant lui valait la conquête d'un grand pays ou d'une forteresse.

Ce qui le rendait plus digne d'éloges, c'est que l'homme brillait en lui avec le héros; qu'il savait réprimer l'ardeur du carnage; que le plus doux de ses triomphes étoit de pouvoir sauver la vie aux vaincus, et que, fidèle à ses promesses, il ne s'écarta presque jamais de l'humanité et de la justice. Il avait gagné l'amour et la confiance des troupes par la bonté de son cœur, par son affabilité, par son exactitude à pourvoir à leur subsistance, et par son attention à

ne pas les exposer mal-à-propos. Falloit-il marcher au combat? la joie brilloit sur tous les visages; c'était la fête du dieu Mars: sous les ordres d'un chef adoré, chaque soldat devenait un héros; sûrs de vaincre, tous éclataient en prodiges, supérieurs peut-être dans leur ensemble à la phalange macédonienne et aux légions romaines. Tels nous avons vu souvent les soldats françois, sous le commandement de leurs chefs, matriser et enchainer la victoire.

Mais ce qu'il y a de bien admirable, c'est que le camp de Marlborough ressembloit à une ville tranquille et bien gouvernée, où règnent par-tout la décence et les bonnes mœurs" (pp. 15–17, Vol. I., "Histoire de Jean Churchill, Duc de Marlborough," Paris, 1808).

CHRONOLOGY OF THE CAMPAIGN OF 1704.

Dutch army to defend Netherlands while Marlborough led other allies to attack on France by way of Valley of Moselle.

The army was at Ruremond which he reached *May 7th.*—He was at Mæstricht *May 10th.*—Kerpen *May 20th* (where he received messages from Overkirk and Baden).

Passage of Moselle and Rhine at Coblentz on *May 26th.*—Rhine used for conveyance of baggage and artillery.

Broubach May 27th.

Cassel May 29th.

Great negociations at Mayence. French fear attack on Alsace.

Ladenburg *June 3rd.*

Passage of Neckar.

Erpingen *June 7th.*

Great solicitude for soldiers *see* Coxe T. 162.

June 9th.—Mondelsheim where he met Eugene for the first time.

Baden joins Marlborough and insists on command on alternate days while Eugene goes to Rhine.

June 14th.—Ebersbach.

June 19th.—Pass of Gielingen carried.

June 24th.—Near Elchingen, opposite the strong entrenched camp of the Bavarians at from Lawingen to Dillingen. Marches along it to the Wernitz against the Bavarian post on the Schellenberg.

July 1st.—At the foot of the Schellenberg.

July 2nd.—Schellenberg carried. Compliments of the Emperor (Coxe 178).

July 5th.—Danube passed in five columns junction of an army from all parts affected without the loss of a single corps.

July 7th and 8th.—Lech passed on pontoons.

July 16th.—Fall of Rain.

July 18th.—Aicha.

July 30th.—Bavaria handed over to military execution. Wholesale burnings, distresss of Marl. 183.

Tallard joins the elector at Biberach. Eugene moves back from the Rhine to Hochstadt, but allies were so separated as to be in danger of an interposition between the parts of their divided front.

Allies resolve to effect a junction on the Danube.

August 6th.—Margrave of Baden despatched to invest Ingoldstadt.

August 10th and 11th.—Marlborough passes Danube north at Merxheim to join Eugene.

August 11th.—Marlborough joins Eugene on the Kessel—Danube on left. Kessel in front.

August 12th.—From tower of Dappheim church the commanders descry Gallo—Bavarian army marking out a camp between Blenheim and Lutzingen.

August 13th.—Battle of Blenheim.

DESCRIPTION OF THE LINES OF 1705

The construction of this formidable barrier which was partly artificial, had employed the space of no less than three years. It commenced at Marché au Dames, on the Meuse, to the east of Namur, passed by Gerbise to Wasseigue on the Mehaigne, and from thence stretching to the Little Gheet, followed the left bank to Leuwe, leaving Hanut on the east and Tirlemont on the west. Between Leuwe and Aerschot, the Great Gheet and the Demer formed a natural defence, and from Aerschot ran a new series of intrenchments to Antwerp. On the flanks were the two fortresses of Namur and Antwerp, and in the interval were numerous fortified posts, particularly Leuwe, Diest, Sichem, Aerschot, and Lierre. The French army, amounting to 70,000 men, was posted in such a manner as to draw the utmost advantage from this extraordinary effort of skill and labour. Villeroi, with the main body, continued his head-quarters at Mierdorp, and the rest of the troops were disposed on different parts of the line, between the Great and Little Gheet, in situations from which they could most readily assemble in force on the points threatened with an attack.

To pass a barrier, strengthened with all the resources of art, covered by rivers and marshes, and defended by an army superior in numbers, was an enterprise of the boldest and most critical kind; and Marlborough, therefore, employed all the powers of his inventive genius to distract the attention and baffle the combinations of the enemy (p. 289 "Memoirs of the Duke of Marlborough etc."—Coxe).

CONVOY FROM BRUSSELS TO HECHLIN AND LILLE.

The first to be attempted was Lille, the strongest place in French Flanders, and one of the earliest conquests of Louis XIV. But the prospect of success was not great: there was only one good road, that from Brussels by which supplies could be brought up the road from Ostend, being but a narrow strip of causeway, and the autumn rains would soon begin. The siege materials from Holland and the Rhine were collected at Brussels, which was sixty miles from Lille. A long train twelve miles in length of ninety-four cannons and 3000 tumbrels drawn by 16,000 horses set out from Brussels on the 6th August and in five days crossed the Scheldt. A strong detachment from Eugene's army covered Brussels, the remainder marched as a convoy, and Marlborough's army was in readiness to move if the enemy gave any indication of disputing its progress. But although it was so important to the French to stop it, they did not venture out to attack. A detachment of 18,000 advanced from Ghent and Berwick also put a corps in motion; but nothing was attempted. Vendôme believed that the whole movement was a feint to entice him out of his position; Berwick believed that Mons might be in danger, and therefore dispatched a detachment to secure it; none of

the generals nor Louis XIV. entertained any apprehension for Lille, which was Vauban's master-piece, and it was indeed considered rather an advantage to the French that the allies should waste their strength in so quixotic an undertaking.

Lille originally, as its name (L'Isle) imports, an island, was naturally strong, the surrounding plain, at one time an expanse of marshes from the overflowing of the Deule, being easily flooded. Deep canals uniting the Scarpe and the Lys, had drained the swamps, and by engineering skill the Deule, which flows through the town, was made along with its tributary, the Marque, to flow round the city as a moat. The city was defended by strong walls, bastions, and outworks, and especially by a great pentagonal fort the citadel which was on the north-west, and was also isolated by a moat. A few days before the allies appeared under the walls the old but still high-spirited marshal, the Duke of Boufflers, the gallant but unsuccessful defender of Namur against William III., entered the place, and the garrison now numbered 15,000 men.

CELEBRITY OF THE SIEGE OF LILLE.

Déjà le bruit de cette expédition remplissait une partie de l'Europe. L'électeur de Saxe, roi détrôné, et le landgrave de Hesse-Cassel, arrivèrent le 19 au Camp de Marlborough, qui fit passer en revue devant eux la première et la seconde ligne de son armée. Ces princes se rendirent dès le lendemain à l'abbaye de Loo, où ils furent traités avec une magnificence digne d'eux. Frederic-Auguste, l'année suivante sur le trône de Pologne, avait son quartier préparé dans l'abbaye de Marquette; mais il voulut rester auprès d'Eugène. Le Comte Maurice son fils, si célèbre depuis sous le nom de maréchal le Saxe, était venu le rejoindre. Le Prince électoral d'Hanovre, depuis rois de la Grande-Bretagne. Avec le landgrave de Hesse, étaient ses trois fils, dont l'un porta la couronne de Charles XII. Quand on lit tant de beaux faits d'armes, exempts des mensonges de la fable, ennoblis encore par le rang des guerriers, on est tenté de rire de pitié au souvenir des roitelets de la Grèce, qui, sous prétexte de venger le rapt d'une femme sans honneur, allèrent mettre devant Troie un siége ridicule (" Hist. de Marlborough, 369 ").

CONVOY ACTION AT WYNENDALE.

On the first news that the convoy had departed, Count de la Motte advanced to Oudenberg, but the post being already occupied, he hastened by Ghistel, to intercept it in the defile of Wynendale. Finding himself anticipated by the allies, whom he descried at five o'clock in the afternoon, he opened a cannonade, which lasted two hours. In the interval he found his troops in several lines, the infantry in front, the cavalry in the rear; and then advanced, in full confidence, to overwhelm a force which did not amount to one half of his own. Within a few minutes the enemy began the attack, but approaching the allied lines were received by such a fire from the ambuscade in the wood, that the left wing gave way on the centre. The fire of the opposite ambuscade was then opened, and soon threw their whole line into confusion. They however still advanced, and broke two battalions: but reinforcements being drawn up from the rear, they were repulsed. They made a third attempt, but the fire in front and flanks again throwing back their wings in the centre, they retired in the utmost dismay. Neither the threats nor example of their officers could induce them to return to the charge, but after some distant and scattered vollies they feebly relinquished the contest (p. 319 " Life of Duke of Marlborough "—Coxe).

"NE PLUS ULTRA" LINES.

The *ne plus ultra* lines stretched from Namur on the Sambre and Meuse to the coast of Picardy. The object was to keep the allied forces beyond the interior lines of fortresses which covered the frontier on the side of Arras and Cambray. From the left it ran along the marshy banks of the Canche, supported by the posts of Montreuil, Hesdin, and Frevent, and in front were the fortresses of Dunkirk, Gravelines, Calais, and St. Omer. The Canche was connected with the Gy by redans; the Gy and Scarpe were checked by dams causing inundations. A canal of communication was opened from the Scarpe to the marshes of the Sanzet near L'Ecluse; there were forts at Aubigny, Pallue, and Aubanchoil; a fortress at Bouchain and a tête du pont at Denain, the course of the Scheldt was thus covered to Valenciennes; further entrenchments to the Sambre were supported by Le Quesnoi and Landrecies. Meubeuge and Charleroi completed the defence of the Sambre as far as Namur.

M. DE FEUQUIÈRES ON LONG LINES.

"On a vonlu, dit il, faire un systéme nouveau de guerre défensive derrière des lignes d'une longue étendue de pays; et l'expérience a fait connoître la fausseté de ce système, qui réside en deux points incontestables. Une armée dans des lignes n'en peut plus sortir qu'en défilant; mais l'ennemi qui s'en approche, est libre dans tous ses mouvemens, qu'il fait comme il lui plaît, sans craindre d'inconvénient. Une armée dans des lignes n'y est jamais ensemble, parce qu'il faut qu'elle garde un trop grand front; et par conséquent, lorsque l'ennemi attaque un endroit de la ligne, dont il a dérobé la connoissance, soit par un mouvement que la nature du terrain lui aura donné la facilité de cacher, soit par une marche de nuit, pendant qu'il fera attaquer le coté opposé à celui de la véritable attaqué il est certain que cet attaquant n'aura jamais à faire qu'à une partie de l'armée, dont le reste ne pourra même marcher au secours du corps attaqué que très—difficilement, et en colonne ce qui est très-périlleux.

Ainsi je conclus que l'armée qui est constrainte dans tous ses mouvemens, est toujours inférieure à celle qui fait tous les siens avec une liberté si entière, qu'elle peut hasarder les moins prudents sans crainte d'en être châtiée. Des lignes d'une grande étendue, ajoute M. de Feuquières ne peuvent être suffisament garnies de redans et d'ouvrages fermés: ainsi elles ne peuvent jamais être bonnes; elles ont été forcées autant de fois qu'elles ont été attaquées" (pp. 92–93 "Hist. de J. Churchill, D. de M.," Vol. II.).

ORGANISATION OF ARMIES 1702–1713.

The infantry was organised in battalions of 13 companies of 50 men each = 650 men and 40 officers. Armed with "fusils avec baïonettes à douille"—pikes and muskets were given up, 1703.

The men drew up in 4 ranks and in 3 after the diminution of numbers at the close of a campaign.

The cavalry was in squadrons of 4 companies of 35 men each = 140 men and 16 officers. The proportion of cavalry was $\frac{1}{3}$ or $\frac{1}{4}$ of whole army.

The battalions and squadrons formed regiments, but their number in a regiment varied from 1 to 6.

The artillery formed a park outside the army and was not considered as a tactical unit of organisation—went into battle, was used and went back into park.

Regiments of infantry and cavalry formed brigades, which in their turn formed the wings and lines of the orders of battle.

First line—infantry in centre and cavalry on wings.

Second line same order, but not so strong.

There was a feeble reserve—2 or 3 battalions with 5 or 6 squadrons.

Cavalry charges were generally delivered at a trot, on a very narrow front and with great intervals between the squadrons.

Although the infantry had fusils with bayonets fitting around the barrel, and not into the barrel, and cartridges and pouches, yet the fire was very slow indeed as compared with that of any modern weapon.

There were few roads and a limited number of passages of rivers. It was dangerous to approach the banks of rivers except at given spots owing to the lack of artificial drainage.

There was a vast number of fortified places.

The army was an integer. This lack of mobility in armies gave more importance to positions and lines.

THE EMPEROR LEOPOLD'S LATIN ENCONIUM ON MARLBOROUGH.

MONUMENTUM.

Æternae Memoriae Sacrum.
Anno MDCCIV die XIII Augusti,
In hac regione
Ingenti clade fusus est Exercitus Gallo-Bavarus
Ductus ab Emanuele, Electore,
Et Franciae Marechallis de Tallard et Marsin
Quorum alter in Prælio Captus
Cum XL præfectis Belli primariis IXC minoris
Ordinis, et XII M Gregarüs, praeter delelos
In Campo XIV M et XIV M in flumen
Præcipitatos,
Exercitui Victori, cum immortali gloria, imperavit
JOANNES DUX DE MARLBOROUGH
Anglus,
Qui
Sub auspiciis Annæ Reginæ
Et Fœderati Belgii ordinum
Strenuum agmen
A Tamisi et Mosâ ad Danubium adduxerat ut
Germaniae periclitanti succurreret.
(Rousset 200).

A PLEA FOR INDIRECT FIRE.

BY

MAJOR J. L. KEIR, R.A.

Colonel Hildyard's very valuable and interesting contribution to the journal of the "R.U.S. Magazine," in the shape of a compilation of "Von Löbell's annual report on the changes and progress in military matters during 1894," appears in its December number. Under the heading 'Field Artillery Tactics' the leading artillery controversies of the day receive impartial treatment, and one is placed in possession of the most powerful arguments, which have been brought to bear from both sides, in the course of the investigation. Prominent among the above appears the question, whether the best advantage is to be derived from direct or indirect fire, which is summed up as follows:—

Von Löbell's report.

"When the conditions do not necessitate the employment of indirect fire, preference should be given unreservedly to direct fire. But as circumstances may, against our will, force us to use indirect fire, we must make ourselves thoroughly familiar with it and practice it in peace time."

Summary of views with regard to direct and indirect fire.

* * * * * *

From the above it is evident what great stress is laid on this nature of fire on the continent, and it is now proposed to array its merits and defects, and to urge that the altered circumstances of modern civilized fighting seem to demand a more careful study of its employment.

In our artillery, a commander, about to occupy a position, has 3 courses open to him. He may (1) advance boldly and attack his enemy in the open, face to face; (2) halt behind the brow of a hill and, after having completed his preparations for the attack, attack him from his own side; (3) remain concealed behind the hill and attack him from under cover.

Our different methods of attack.

The general accessories, with which he provides himself for these different methods, are (1) the tangent sight; (2) the Scott's sight; (3) the clinometer.

Advantages.

(1).—Laying made a more mechanical operation.

With the first two of these methods, it is not proposed to deal; but the third, and its accessory, will, for the moment, occupy our attention.

The following advantages are claimed for indirect laying by means of a clinometer:—

(1). Assuming the instrument to be correctly set, all personal error of elevation is eliminated; and, once the range and fuze have been found, the fire should be more rapid and more effective than when a gunner has to lay each round. With regard to this it is also urged,

that with the broad, thin targets presented by infantry and artillery, elevation is of much greater importance than direction; and that a well trained battery, using a clinometer marked in yards, should be able to find the actual range more rapidly at an absolutely unknown distance than one using the tangent or Scott's sights.

The two main essentials to successful artillery practice are (1) good laying; and (2) good observation: and if the former can be reduced to a merely mechanical operation, a great step in advance will have been made. It is much easier to see an object when standing up and looking through glasses, than when bending down looking over the sight of a gun; and consequently, in cases where the object is broad and badly defined, it will be quicker and easier to find the range of it, by means of a good clinometer directed from the handspike, than to trust to the uncertain vision of the average gunner, who even in peace time is liable to nervousness and excitement. In our competitive practice it is necessary, for obvious reasons, that the guns of the target battery should be placed in the open, where the advantage of the very accurate Scott's sights over the clinometer, for an actual gun upon gun attack, is evident; but will this be our normal target in the future artillery contest?

Will the enemy's guns be as a rule clearly visible?

That the value of good observation is greatly enhanced by the addition of reliable laying, goes without saying.

(2). By using the method of indirect laying, guns can, under favourable circumstances, be brought into action under cover and unseen by the enemy.

The introduction of smokeless powder has very much increased the importance of this advantage, and reflection on the subject of a modern artillery contest brings us to the conclusion that, in a duel in which both sides are equally well armed and trained, an inferior artillery attacking by the direct method courts destruction. But, on the other hand, an inferior force of this arm, employing the indirect method against a superior adversary, whose position is plain to view, may attack with a fair prospect of success, should the ground be favourable to its concealment. And further, that in future, such a thing as artillery surprise will be possible; as a well posted line of guns, which has been brought into position unobserved, will be able to deliver an unopposed, and consequently steady and effective fire, against its bewildered antagonist. These results are, however, only possible with the aid of the clinometer.

Advantage (2)—Guns can be placed so as to be able to fire unseen by the enemy.

(3). In cases where the position has been occupied by the direct method and the range and fuze have been found, an effective fire can be maintained in spite of smoke, haze, or mist, by means of clinometer elevation; giving increased accuracy and saving fatigue to the layers, as, for instance, in the preparatory stage of the attack on a position, previous to the infantry assault.

Advantage (3)—Accurate fire can be maintained in spite of smoke or atmospheric influences (rain, snow, etc).

Indirect laying is, on the other hand, at present, subject to the following disadvantages:—

(1). The operation of ranging, owing to (1) the complication introduced by the angle of sight, (2) the time taken in placing the aiming posts, and (3) the clinometer being marked in degrees and

Disadvantage (1) Is slower than direct fire.

minutes, is more lengthy than when sights are employed; the chief delay being experienced in passing from range to fuze.

When reliable range-finders are available and can be used, the first difficulty disappears, as the length of fuze is simply that due to the measured range. The second can be reduced to a minimum by constant practice. And the third is a matter for our manufacturing departments; all that is asked for is, that we may be kept abreast of foreign nations in this branch of gunnery.

Means to increase rapidity.

(2). A second disadvantage of the indirect method is, that when firing from behind cover the slope leading up to the hill behind which the guns are posted is not commanded by their fire.

Disadvantage (2) Undefended space in front of guns.

Were guns alone engaged this would be a serious drawback. In a position, however, in which the guns could be so placed, there would be little danger in their firing over the heads of their own infantry, who would defend the slope with their fire. In any case well posted combat patrols ought to render the position of the guns secure.

(3). It cannot be denied that, when great accuracy with regard to direction is necessary (as for instance in firing at single guns or pits), the clinometer cannot compete with a telescopic sight. The accurate distribution of fire along a rigidly fixed and motionless front also places it in an unfavourable light.

Disadvantage (3) Less accurate for direction.

Will this defect be as serious as it appears on the practice ground?

There is a natural tendency to overdo anything new, and when we call to mind the absurd lengths to which the deliberate method was at one time carried, we may well shrink from a retrograde tendency in this direction; and visions of the indirect method at 600 yards, and a perpetual search for cover, rise before us.

Indirect laying to supplement not replace direct

All that is asked for is, fair play for the clinometer; that its increased importance may receive recognition; and that the training in its use may be as thorough as that with the sight at present is.

The actual tactics which will arise from the use of smokeless powder appear simple enough, but that full advantage may result from them, sound technical training, and encouragement towards proficiency in the use of the clinometer, are necessary. In order that it may be developed to its full extent it should be treated on an equality with other two methods. Majors of batteries have, on the practice ground, a certain test annually set for them, to come up to the requirements of which they naturally devote their best endeavours. The system is an admirable one, and has produced the best results; and all that is humbly suggested is, that one series of this competition may be a timed one of indirect laying, with credit for keeping out of view from the target end; for then, and only then, will the three methods be on an equal footing. To expect that large masses of artillery will, as a rule, be able to use this method, is as absurd as to rely on its use during the later stages of a battle. Where, however, it would find its most useful sphere, would appear to be, in the earlier stages, when the ground favours an unseen advance and artillery surprise is possible.

Direct fire must eventually be resorted to.

Again, long lines of guns are liable to enfilade, and great moral effect would result from even a single battery, whose position was not

Situations which appear favourable to indirect fire

visible, firing on such a target. Formerly, such a situation was hardly possible, this we venture to think is no longer the case. One thing however is certain, viz., that in these days of highly trained gunners, an attack by the direct method, on a well posted and efficient artillery, will be an exceedingly costly operation and should only be resorted to in case of actual necessity.

Example of ground favourable to indirect fire.

As an example of what has been stated, those acquainted with the ground in the vicinity of Wörth, will agree that the difficulties of the German gunners would have been enormously increased had they been opposed by the actual number of French guns available at that battle, but equal in range and power to their own, firing smokeless powder, and using indirect fire, from well chosen positions behind the Wörth, Elsasshausen, Morsbronn ridge.

Indirect fire at Manœuvres.

There is one more point in connection with indirect fire which tends to discredit it, viz., the scant recognition which it receives from umpires at manœuvres and field-days. At the conclusion of the New Forest Manœuvres an umpire was heard to observe that the smokeless powder had proved a failure, because it was impossible to tell what the guns were doing. If manœuvres strive to be an accurate representation of war, surely small difficulties of this nature should not debar us from gaining valuable experience. So long as noise and smoke is the criterion of artillery success on these occasions so long will the true methods of attack remain unpractised.

Conclusion.

In conclusion, we come to the question. Is indirect fire worthy of further development or not? If this question be answered in the affirmative, then follow the questions (1).—Is our present clinometer a satisfactory one? And (2).—Is the training for indirect laying as thorough and practical as that for direct?

It is regretted that the cause pleaded for has not been in better hands, but it can be honestly said that the views, so imperfectly expressed, have been arrived at after considerable thought, and will, it is hoped, meet with some consideration from the readers of these "Proceedings."

THE INFLUENCE OF AMMUNITION ON SHOOTING.

BY

CAPTAIN J. H. MANSELL, R.A.

THE hope of the gunner is to make his shooting effective. With this object increased attention is daily paid to points of the minutest detail.

It has long been recognised that ammunition is one very material point. We may, perhaps, eliminate errors of gun and of layer, but it is at once evident that there are other factors on which the regularity of the shooting depends. Regularity of, is synonomous with, effective shooting; provided the guns are ranged correctly. This may appear a truisim, none the less it is well to bear it constantly in mind in any consideration of ammunition.

The factors that make up ammunition are :—

(1). Powder. (2). Fuzes. (3). Shell.

It is my endeavour in this paper to show that the above is the order of relative importance of these items, and to express in actual figures the effect of variations in them on the actual shooting of the gun. For the sake of demonstration I take the 15-pr. B.L. gun mounted on a Mark II. carriage and firing at an elevation of 3° 12′, corresponding in the range table to a range of 2000 yards. Identical conclusions apply to every gun in the service, whether firing powder or cordite; with the reservation, of course, that considerations of higher velocity, etc. affect the arithmetical differences though not the general principles. The calculations are too lengthy, and not, I think, of sufficient general interest to warrant their inclusion. I give the results. In every instance the trajectory has been worked out by Bashforth's method. The agreement between the results of actual firing, as set out in the range table, and the calculated results (when using the range table data of muzzle velocity and weight of shell) is so close, that I venture to hope it will vouch for the general accuracy of all my results.

(1) *Powder.*—Owing to difficulties of manufacture it is impossible to turn out the different lots of powder so as to be identical in all respects. All that can be done is by blending, etc. so to reduce these differences as to make the various lots as similar as is practicable. If we examine the specification for S.P. powder,[1] we find that the mean muzzle velocity of a lot must be between two limits which differ by 40 f.s. So that if

[1] Hand-book for Gunpowder and Guncotton. By Major-General W. H. Wardell.

the range were found with a cartridge made of one lot of powder and the next round were fired with a cartridge of another lot, the gun might shoot entirely differently. Assuming that all the cartridges are of one lot, and, neglecting for the present items 2 and 3, it is clear that once the range is found the gun will continue to shoot to that range within the limits of error of its "probable rectangle." The minor variations in muzzle velocity, due to variations in the powder, are part of the cause of errors in shooting which are summed in the term 'probable rectangle.' The mean range corresponds to the mean muzzle velocity of the series. I wish to clearly distinguish between minor variations of muzzle velocity in rounds of the same lot and the variations between the *mean* muzzle velocity of rounds of different lots. The latter only will be considered in this paper, as being within the province of the battery officer to correct for. The former is for the consideration of the manufacturer.

The range table for the 15-pr. B.L. gun is made out for a velocity of 1550 f.s. Taking the specification limit of 40 f.s. there are lots in the service which may give a mean velocity of anything between 1570 f.s. and 1530 f.s. The range table gives the elevation for 2000 yards with the Mark II. carriage as 3° 12′. My calculations with the range table data give the range for 3° 12′ as 1994 yards. This is a sufficiently close result to justify my other calculations which are made in a similar manner to the 'test' one.

The following table shows the results assuming the three muzzle velocities of 1530, 1550 and 1570 f.s. In each case the gun is fired at an elevation of 3° 12′ and the range is on the horizontal plane passing through the resting points of the wheels.

Muzzle velocity.	Range. Yards.	Time of Flight.	Remaining velocity.	Angle of descent. Degrees.
1530 f.s.	1962	4·945 secs.	940 f.s.	4·602°
1550 f.s.	1994	4·991 secs.	947 f.s.	4·61°
1570 f.s.	2037	5·055 secs.	947 f.s.	4·658°

At the outset then we are face to face with the fact that, when shooting at the range table elevation for 2000 yards, it is possible with different lots to get a variation in range of 75 yards.[1] But if we continue to use the same lot of powder for consecutive rounds it is immaterial which of these velocities the powder is giving. The guns can be elevated so as to range correctly for the velocity at which they are shooting, and if they hit it matters not whether they are shooting to the range table or otherwise.

Before passing to the consideration of fuzes, it will be well to notice here another point in the above table. Column 1 on the range table gives the remaining velocity at any range, assuming a muzzle velocity of 1550 f.s. I find that the remaining velocities, so given, agree with

[1] This does not take into account the variations in velocity due to various ages, and conditions of different lots.

those calculated by Bashforth's abbreviated method. The abbreviated method assumes the trajectory to be a straight line. It only holds over short distances, or at high velocities, when the assumption is nearly true. The remaining velocity is of importance when we consider errors of times of burning of fuzes. The range table gives the remaining velocity at 2000 yards as 997 f.s. My calculation for the range table elevation and with the same muzzle velocity gives a remaining velocity of 947 f.s. For the purposes of this paper I prefer my results and use them in the comparisons which follow.

(2) *Fuzes.*—To simplify the consideration of fuzes we will assume that arrangements have been made to ensure regular shooting of the powder.

The range table gives the time of flight for 2000 yards as 5·2 secs. My calculation for the 1994 yards range is 4·991 secs. Considering the calculated trajectory, and assuming we wish to burst our shell 80 yards short of the target, the time of flight to this point is 4·738 secs., or say 4·74 secs., and our fuze would be set to burn for this time. The height above plane of the trajectory at this point is 19·34 feet.

In the case of powder, I was able to point to a published specification. I regret to say I am unable to find one for fuzes. We shall surely, however, be well within the mark if, allowing for age and variation in manufacture, we say that a possible error of $\pm$ 0·25 secs. may occur when our fuze is set to burn for 4·74 secs.

If the fuze burns for 4·74 + ·25 = 4·99 secs. the shell will practically burst at the target. If the fuze burns for 4·74 − ·25 = 4·49 secs. the shell will burst 159 yards short of the target, and at a height above plane of some 38 feet. Neither of these shell could be considered as satisfactory time shrapnel.

In the case of a higher velocity gun these errors would be even more pronounced.

A constant powder has been assumed in the foregoing. It does not require a vivid imagination to picture what pitiable results might follow if large errors were to creep in there.

(3). *Shell.*—The next question is—how does weight of shell affect the shooting.

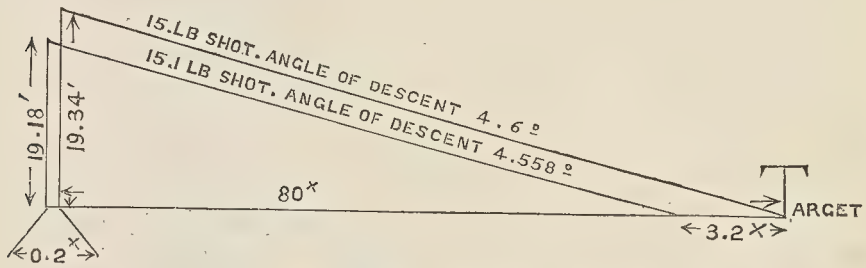
For the purpose of this investigation I have taken a shell weighing 15·1 lbs. or rather over 15 lbs. 1½ ozs.

There are two separate points to be considered, viz: the effect on ranging and the effect on time shrapnel, of a difference in weight of the shell. This is necessary, because the times of flight and remaining velocities are not the same for shells of different weights which range the same distance.

First, we must notice that the charge of powder which would impart a muzzle velocity of 1550 f.s. to a 15 lb. shot will only impart a muzzle velocity of 1545 f.s. to a 15·1 lb. shot. Firing then at the same elevation of 3° 12′, the 15·1lb. shot will range 1990·8 yards, as against the 1994 yards of the 15 lb. shot; an error in range of 3·2 yards.

The time of flight of the 15·1 lb. shot fired at this elevation is 4·985 secs., and its remaining velocity 948·6 f.s. It will be remembered

that in order to burst the 15 lb. shell 80 yards short of the target the fuze was set to burn for 4·74 secs. We now have to investigate where the 15·1 lb. shot would burst, with its fuze set to burn for 4·74 secs. Briefly it would burst 80·2 yards short of the target, at a height above plane of 19·18 feet. The respective trajectories and points of burst are best set out on the accompanying diagram, which is, of course, in no way to scale.



It would be difficult to distinguish any practical difference in the effect of these two shrapnel. To detect the different positions of their burst would require exceptional powers of observation.

The slight effect of difference in weight of shell on the shooting may seem somewhat surprising. With the view of further checking the above result, I have calculated the trajectories for these two shell when fired at an elevation of 7° 14′. This elevation corresponds in the range table to a range of 3500 yards. The calculated result for the 15 lb. shell is 3470 yards. This result gives an error of less than ·86% and is therefore sufficiently close for the purposes of comparison. The results of the two shells are set out in the following table :—

Weight of shell. lbs.	Range. Yards.	Time of flight. secs.	Remaining velocity.	Angle of descent. Degrees.
15	3470	10·01	821·3	10·941°
15·1	3468	9·999	824·5	10·901°

In this case the ranging is practically the same for both shells. If fuzes are set to burst the 15 lb. shell 70 yards short of the target, the 15·1 lb. shell would burst some 62 yards short.

It is possible that a slightly wider difference in weight than I have assumed may be found, but it does not appear that the effect on the shooting will be of importance. It must be borne in mind that weight of shell is a comparatively easy matter for the manufacturer to regulate. That being so any shell which is found in the service may be fired without anxiety as to its weight.

Variations in the shape of head, position of centre of gravity, etc., undoubtedly affect the shooting. Such considerations are outside the range of practical artillery, and under service conditions difficult, if not impossible, to allow for. Shell can only pass into the service if with-

in certain limits. Variations in shooting, due to these limits, are not important enough to merit serious consideration. For all practical purposes there is no reason why the gunner should be suspicious of his shell. He can confidently use them in the assurance they are virtually identical.

The above considerations lead to the conclusion; that every gun of a similar nature, in one battery command and having the same fire area, should use cartridges of the same lot of powder, and fuzes of the same thousand of manufacture, at the same time.

It is outside the purpose of this paper to speculate as to how the conclusions arrived at can best be carried out in practice. Its object has been achieved, if it enables those numerous officers, who are striving to improve the shooting of our artillery, to more vividly picture the serious errors that may result unless some system be adopted which tends to minimize the ill effects caused by unavoidable variations in service ammunition.

BAYARD'S ARMOUR (SO CALLED),[1]

COMPLETE EXCEPT TUILLES AND FINGER-PLATES OF GAUNTLETS.

BY

CAPTAIN C. ORDE BROWNE, LATE R.A.

ALL that can be said of this armour *with certainty* is, that it is a beautiful suit of the beginning of the 16th century, that it has been handed down as that of the Chevalier Bayard, and that it resembles the armour in which he is generally depicted in a remarkable way.

The facts bearing on the claim are noticed hereafter, but supposing that we adopt the idea that this is really Bayard's armour, a few words may be desirable as to his character and the deeds he performed.

Pierre du Terrail, known as "the Chevalier Bayard, *sans peur et sans reproche*," is considered the model of Christian knighthood.

He was not a General, indeed he refused any large command, but he habitually executed daring operations by which sometimes battles were won. The victories of Fornova, Agnadello and Marignano were attributed in a great measure to him, but his most notorious feat, perhaps, was his defence of a bridge over the Garigliano single handed on horseback against 200 Spanish knights. He hustled two into the water and held the narrow bridge for a short time until the French arrived and drove back the Spaniards, when Bayard pursued them until he was temporarily taken prisoner, a frequent occurrence with him. He once nearly captured the Pope in a dashing expedition which he undertook with this object. His special characteristic, however, was an unselfish chivalry which appeared to be almost infectious in the way in which it spread to others. He refused money from prisoners and was himself released without ransom, first in Italy by Ludovic the Moor, and afterwards at the battle of the Spurs by Henry VIII. He died with his back against a tree after defending the passage of the Sesia, refusing to be carried off the field when mortally wounded.

The following information has been obtained on this suit of armour. Sir Samuel Meyrick in his "Antient Arms and Armour," Vol. II., p. 242 says, "A suit of armour now in the Rotunda at Woolwich and brought from the Chateau of St. Germaine in France, certainly of this period, is attributed to the Chevalier Bayard. If it be really that which he wore, he does not appear by any means to have been a tall man."

In Vol. III., p. 136 he says that in the Rotunda "is a collection taken from the French, being part of that formerly at the Chateau of St. Germaine, in which is the armour of the Chevalier Bayard, a *metonière*, a beautifully engraved vamplate, etc." Meyrick does not give his authority. If he is correct this suit was brought from France by the Army of Occupation with the French arms and armour referred to, both in the Rotunda records, and by Meyrick; if so, Sir S. Meyrick probably obtained his information either from the Duke of Wellington, under whom he was working at the Tower, or from officers serving under him.

Acting upon this supposition, enquiries were made in 1888, both

[1] In the Rotunda Museum, Woolwich.

from the present Duke and from the curators of Paris collections of armour. The replies from France were to the effect that no collection of arms and armour was known to have been at St. Germain's, and the secretary of the Duke of Wellington could find no record of arms and armour being brought from France. These replies may certainly show that there exists no record to turn to for information, but the fact remains that in the Rotunda is a remarkable collection of French arms, dating from the beginning of the 16th to the end of the 18th century, including an ugly nondescript kind of pole-axe inscribed "*L'an 4 de la Liberté et le 1er de L'egalité le 10 Août, 1792.*"

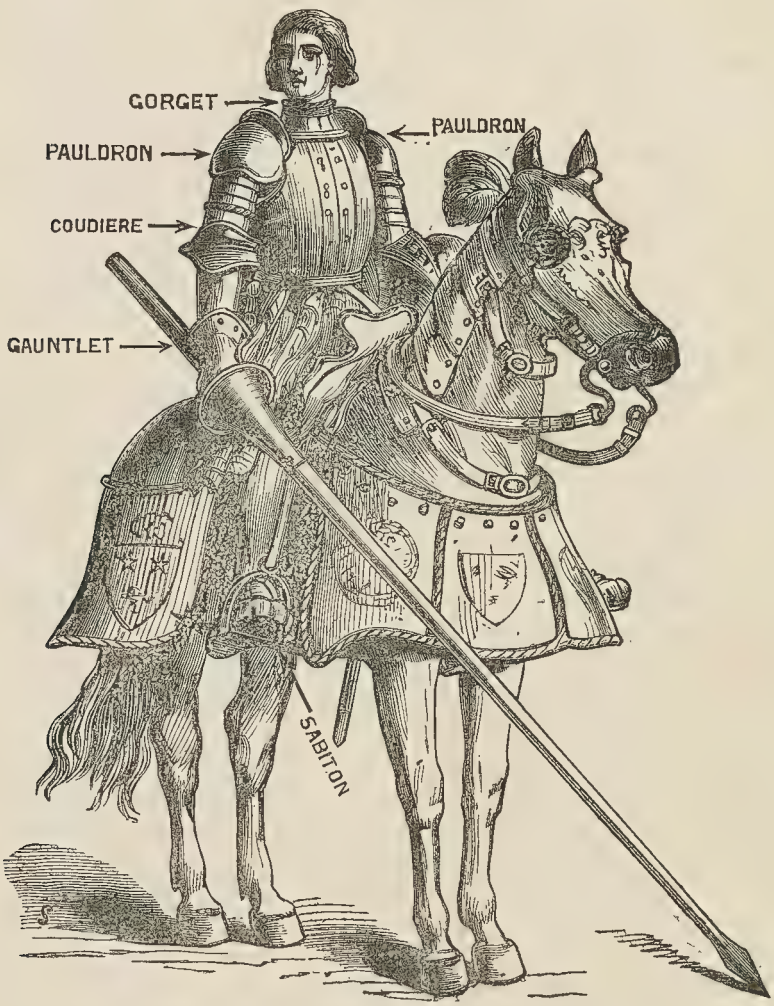


FIG. 1.—Bayard by Alph de Neuville from Guizot's History of France, Vol. II.

In the published Wellington Despatches, the occupation of St. Germain's, by British troops, is mentioned as at all events contemplated. Probably individuals may have visited the place and obtained the arms and armour which, though valuable, do not constitute so large a collection that a record of it need necessarily have been handed down after its removal, nor need the Duke's papers have necessarily mentioned it.

To come to Bayard's armour in particular, Meyrick found such a condition of ignorance prevailing at the Tower, that a suit consisting mainly of armour of the time of Charles I. with legs of the time of Henry VIII., was attributed to William the Conqueror, so that it may safely be said that there was then no critical knowledge available for selecting even a fairly plausible suit for Bayard; yet not only is this suit correct in style and date, but it also happens to resemble the armour in which Bayard is generally depicted so closely that it may be doubted if another suit could be found with so strong a resemblance.

No print of Bayard's armour has been discovered in the British Museum or elsewhere in England, giving characteristic features, but it is likely that better prints or pictures exist in France, seeing that a certain form of armour marked in stripes, is persistently attributed to him.

→ *See* stripes like Rotunda suit.

Fig. 2 & 2a.—Bayard by Alph de Neuville from Guizot's History of France, Vol. II.

Note.—These Figs. are intended to illustrate features attributed to Bayard's armour.

1. Period characteristics (*i.e.* general form of plates, armament, &c.)

2. Shoulder pieces, *see* Fig. 1. Right and left each agreeing with Rotunda suit. *Note* also gorget, elbow pieces and gauntlets.

3. Striped armour, *see* toes in Fig. 1, legs and gauntlets in Fig. 2, also the dismounted suit Fig. 3.

Figs. 1 and 2 are rough sketches from Guizot's History of France, they could hardly resemble the Rotunda suit more closely had they been drawn from it (*see* the stripes, right and left shoulder pieces, elbow pieces, sabitons or armour for the foot, etc.). Fig. 3 shows a

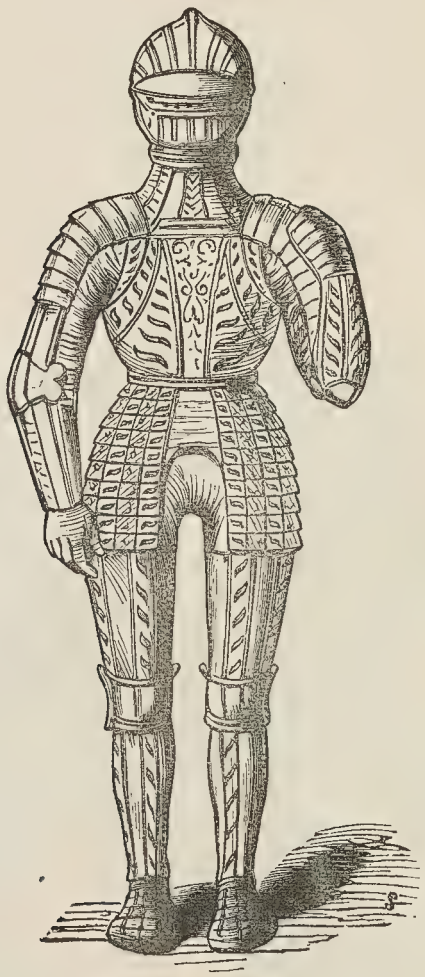


FIG. 3.—Suit selected to do duty for Bayard's in the Musée d'artillerie, Paris (*see* Demmin). It is not now so named. It came I believe from Vienna brought by Napoleon I.

suit selected in Paris to do "duty" for Bayard's armour at one time, but since designated afresh. It is for fighting on foot and came really from Vienna. It is instanced here to show the same selection of striped armour by French authorities.

To return to the Rotunda suit. Special knowledge of armour might have suggested that this suit would pass for that of Bayard, but grossly ignorant persons could hardly arrive at such a result except by the real armour being actually handed down.

Suppose again, for the sake of argument that Meyrick was wrongly informed, and that this armour did not come from France at all. If it was a suit reputed to be Bayard's in a British Government collection, its claim would be perhaps better than coming

from France, seeing that Henry VIII. took Bayard prisoner at the battle of the Spurs and would naturally keep his armour as a trophy, like the suits of Montmorency and Montpensier taken at St. Quinton and shown in the Tudor Exhibition. The only circumstance, indeed, likely to militate against this, is that Bayard was generally treated in an exceptionally chivalrous way.

As to size; this suit is for a powerful man fully 5 feet 9 inches in height. It has been found to be inclined to pinch at the calves of the legs when tried on. This, however, is a very common feature in armour; probably because knights continually rode, and developed their calves less than men of the present day.

The lance in the figure's hand very likely came from the Tower, and

FIG. 4.—Cap-à-pied suit (No. 18) early 16th century, attributed to Bayard, Chanfrein (No. 290) early 16th century from Rhodes. Vamplate (No. 103) 16th century. Sword obtained from store department with blade stamped Sahagum with armourer's mark.

the vamplate on it is said to have been brought with the suit of armour from France.

The horse's chamfron is from Rhodes. It is the right date and style

for the armour and was therefore preferred to a plain bright chamfron which came from France.

The sword came from the Tower, being sent to the Arsenal about 1869 on the figure, now in the Rotunda, in white armour (temp. Charles I.). The blade is apparently an excellent one of the 15th or 16th century with an armourer's mark and the word "Sahagum," perhaps meant for Sahagun, a Toledo armourer of the 16th century. The hilt looks fresh and is probably a cast copy of a 16th century hilt. A similar one exists in the Tower on a larger sword.

The wooden horse came from the Tower, being a likeness of the Duke of Wellington's horse "Copenhagen." Although a man of the Duke's weight could hardly have ridden a horse about 17 hands high, which this is, it is probable that Copenhagen had a great reserve of power. The Duke mentions that the day before Waterloo, after riding him about 30 miles, he decided to consult Blucher, and at the end of the day, after about 60 miles hard riding in all, he relates that he went up to the manger to see if Copenhagen was feeding well, and on leaving narrowly escaped a tremendous kick by which that steed manifested to the Duke's satisfaction that he was quite himself and in his usual temper and spirits.

The saddle came from the Tower in an imperfect state, the steel plates and stirrups have been since added, with the accoutrements which are made up.

No attempt has been made to furnish the horse with any armour beyond the chamfron. On a march on actual service, both horse and man might be found as here presented with the exception of the lance which is not a war lance.

A pair of tassets were formerly put on to the suit but do not belong to it. They can be seen in a case in the Rotunda. Curiously enough they are almost identical with those shown in Fig. 3 and found on other armour made in Vienna (*see* Fig. 5).

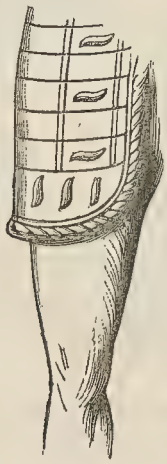


Fig. 5.—Tasset of puffed suit in Ambras collection Vienna, resembling those removed from Bayard.

"ARTIFICIAL ILLUMINATION," GAS AND ELECTRIC, WITH SPECIAL REFERENCE TO THE MODERN DEVELOPMENTS OF GAS LIGHTING, EXPERIMENTALLY AND PRACTICALLY ILLUSTRATED.

BY

PROFESSOR CARLTON LAMBERT, M.A.,

Royal Naval College, Greenwich.

(A Lecture delivered at the Royal Artillery Institution, Woolwich, 16th December, 1895).

COLONEL C. C. TRENCH, DIRECTOR ARTILLERY COLLEGE, IN THE CHAIR.

THE CHAIRMAN—I need not introduce Professor Lambert to you, gentlemen (applause). I am afraid the Professor is at a great disadvantage to-night, because I understand the gas pressure is nothing like what he requires for his work.

PROFESSOR LAMBERT—Colonel Trench, ladies, and gentlemen, I am very sorry to have to announce to you that in one respect, at any rate, I am, as the Chairman has already told you, at a disadvantage, because we find that the gas supply by which the table is served is so deficient that we have absolutely not enough pressure for a single burner. However, you will perhaps kindly exercise your powers of imagination and fancy, when you see a feeble light, that it is an exceedingly brilliant one.

I do not propose this evening to confine myself to the technical part of my subject, but to give a little time to the theory; for I am sure that we shall be more successful in the use of our illuminants if we understand the simple principles upon which the production of light from them depends. I am aware that there are in this room many to whom the laws of combustion and illumination are familiar, and I will ask them kindly to bear with me while I endeavour to make the elementary principles clear to those who may not have had the same advantages.

Inasmuch as all illumination is derived, directly or indirectly, from combustion, it will be well for us to study for a little while what combustion really is, and what are the natures of those substances with which we are chiefly concerned in the combustion of every day life. I will ask you just to look at the screen for a minute or two, and we will run rapidly through the few maxims concerning combustion which are there indicated.

Firstly, air is a mixture of oxygen and nitrogen in the proportion of about one to four by volume. The nitrogen is simply a diluent, the oxygen being the great supporter of combustion. Bodies which burn in air burn more violently in pure oxygen. You have before you an example of the violent combustion of the refractory body, iron wire, in pure oxygen, which would not, of course, burn as you see it, though it might slowly oxidize, in ordinary air. Now we must not suppose that this iron is really being destroyed. Combustion is not *destruction;* it is *construction.* A simple substance when burning is uniting with something else; it is not being destroyed, but it is forming a compound substance. In the experiment before you, the compound which is being formed is iron oxide; it is the result of the chemical union of the iron with the oxygen, and, if I were to gather up the whole of the iron oxide, or *rust* as we call it, which is now being formed, I should find that its weight is exactly the sum of the weights of the iron and the oxygen which have been consumed. I have said that the iron has combined with the oxygen; I might just as well have said that the oxygen has burnt or combined with the iron; either of the two combining substances is burning quite as much as the other.

To illustrate this point I call your attention to an experiment where I am showing you, not a jet of coal gas burning in air, as is usual, but a jet of air burning in an atmosphere of coal gas. The air flame is, under these circumstances, not a bright one; but still it is as much a case of burning as the ordinary gas jet is—the products of combustion being, of course, the same.

The next element we will consider is *hydrogen,* the lightest of all gases. I plunge a lighted taper into this jar containing hydrogen, which jar, you notice, I hold mouth downwards in order to prevent the hydrogen from escaping, and you see that the hydrogen extinguishes the light, although it takes fire at the mouth of the jar where it meets the oxygen of the air, and burns with the pale blue, almost invisible, flame which is characteristic of this gas. The yellow tinge to this flame which you may notice is due to a great extent to sodium in the dust of the atmosphere. Thus we see that hydrogen is not a supporter of combustion, but that it burns or combines with oxygen. The substance which is formed during this burning is water, or rather steam, the intense heat of combustion vapourising the molecules of water as fast as they are formed. Here we have a burning jet of hydrogen gas issuing from a bottle in which the gas is being generated by the action of dilute sulphuric acid on zinc. Although we cannot see the steam which is being formed, yet we can make it evident in the form of water by condensing it on this cold glass tumbler which I hold in the flame. You see that I can wipe the moisture off with my hand.

The next element to discuss is *carbon,* familiar forms of which are coal, charcoal, lamp-black, etc., and, in the purest crystalised shape, the brilliant diamond. When carbon burns in a plentiful supply of oxygen, carbonic acid gas, or carbon di-oxide, is generated. This is an invisible, heavy and asphixiating gas. I have here a tall jar full of it which you notice is standing now with its mouth upwards and un-

covered. I have no fear that the gas will escape, as it is so much heavier than the atmosphere. You see that when I put this lighted taper into it the light is extinguished immediately, and the carbonic acid gas does not take fire. This gas then will not support combustion, and therefore it will not support life, for one of the features of animal life, you know, is the combustion of the carbon of the food in the veins and capillaries of the living body by the oxygen absorbed through the lungs. When we breathe we take in oxygen which, being absorbed by the blood, oxidises the carbon of the food which has been assimilated. The carbonic acid thus generated, and which is the combustion of the carbon of the food, in the veins and capillaries of the living body, by the oxygen absorbed through the lungs, the cause of the dark colour of the blood in the veins, is got rid of at the lungs at each expiration of the breath. This gradual oxidation, or slow burning of the carbon in our food, is the cause of the gentle warmth of our blood. The carbonic acid gas, which is thus being expelled from the lungs of every living animal, and which is also generated in huge volumes in every active fire-place and furnace in the world, and is also a product of fermentation and many other natural and artificial processes constantly going on, would in time so pervade the atmosphere that it would be impossible for any animal to exist in it. A wise provision of nature, however, remedies all this. Under the influence of the direct rays of the sun, or diffused daylight, the leaves of plants decompose the carbonic acid gas existing in the atmosphere, absorbing to themselves the carbon with which they build up their stems and woody fibres, and restoring to the air the pure oxygen which is so necessary for animal life.

As a further illustration of the fact that nothing is really destroyed when combustion takes place, I may mention that when a ton of coals is burnt in a fire-place nearly four tons of carbonic acid go up the chimney; thus neither the coals nor the oxygen with which it has combined has been really lost; they are in a combined form instead of having a separate existence.

Now the chief substances which are burnt to produce light are oil, petroleum, tallow, wax, coal gas, etc. These are all *hydro-carbons*, that is to say, they consist of hydrogen and carbon combined in various proportions, and, therefore, when they burn in air, the products of the combustion are necessarily always water and carbonic acid. I should qualify the statement by saying that the products of the *perfect* combustion of these substances are water and carbonic acid. When carbon, or any hydro-carbon, is burnt in an insufficient supply of air the carbon may unite with only half the proper amount of oxygen, and the gas known as carbonic oxide may thus be formed, which is far more deadly than carbonic acid, inasmuch as it actually poisons the blood of those who inhale it, while carbonic acid simply stifles or asphixiates through its presence diminishing the amount of oxygen in the air which is necessary for healthy breathing.

In addition to the deleterious carbonic acid, which is one of the products of the combustion of coal gas and other hydro-carbons, the water, which is the other product, is often troublesome in another way. For

instance, silversmiths and persons dealing in bright metal goods prefer to have their gas lamps *outside* their windows in order to exclude the water vapour formed which might tend to rust their goods. There is another and a more important reason, however, why outside gas lamps are used; it is the unavoidable presence of a certain small amount of sulphur in the gas, which, on burning, forms sulphurous, and, ultimately, sulphuric acid, the destructive effects of which are well known.

Now I would like to say a word or two about the right and the wrong way of using a gas burner. Never interfere with the natural processes which are going on in an open gas flame; otherwise something worse than comparatively harmless water and carbonic acid may be evolved as the products of combustion. If, for instance, a cool body, such as a kettle of water, be held in the flame of a gas burner, the combustion will not be perfect, and the deadly carbonic oxide gas and the equally poisonous acetyline gas, which latter is one of the compounds of hydrogen and carbon, will be evolved. Put the kettle, therefore, *over* the gas flame, and not *in* it. A good gas stove, with a flue to take away all the products of combustion, is convenient and economical, but a gas stove without a flue is unhealthy in a small room, even when it is properly used, on account of the carbonic acid gas which must inevitable be evolved; and, if it is badly used through the cooking vessels being immersed in the flames, instead of being placed over them, the atmosphere may be made extremely poisonous, and serious results to health, or even risk to life, may follow. I give this warning because I think it is not generally known how deadly an enemy we may make of a gas stove which, if properly treated, should be a most useful friend. I have had personal experience of the saddest results arising from neglect of the simple laws governing the combustion of coal gas. If the use of the gas stove is attended by a pungent smell, however slight, imperfect combustion may be suspected and acetyline is, no doubt, being evolved.

We have studied combustion a little in an elementary and general way, but there may be various rapidities of combustion. We may have, for instance, a very slow combustion, such as takes place when iron is slowly oxidised, or rusts in the open air. This, though it is a slow process, is as true a case of burning as any other kind of combustion is. We may have a more rapid, but still a moderate, rate of combustion, as in an ordinary gas jet, where each particle of hydrogen or carbon does not burn till it comes into contact with the oxygen necessary to unite with it. If, however, the atoms of two substances are so intimately and accurately mixed that each atom of the one finds itself in the immediate neighbourhood of exactly the necessary number of atoms of the other substance, then, when combustion takes place, it is instantaneous, and we have a rapid or explosive effect. It is hardly necessary for me to dilate upon explosions under the roof of the Royal Artillery Institution—the atmosphere is almost redolent of the subject—but I will give you just one little example. I have here an intimate mixture of hydrogen and oxygen atoms in their exact combining proportion. On applying a light they unite instantaneously

with explosive violence, as you hear, forming a very small quantity of highly heated water vapour which is ejected from the mouth of the flask.

And now we come to the subject of the artificial production of light for practical purposes. What we almost universally want is *white light*. Let us consider for a moment the nature of light generally, and of white light in particular. We may say that light generally consists of rapid vibrations of the ether which pervades all space. If the vibrations are of a certain rapidity they may affect the eye with the sensation which we call *red light;* if they are of greater rapidity they may give us *orange light*, and so on through all the spectrum colours until we come to the waves which are of the greatest rapidity which the retina of our eyes can appreciate, and which give us the sensation of *violet* light. If rays emanating from a radiant body are of a less rapidity than those which give us red light, they are invisible to our eyes, but they may give us the sensation of heat; if, on the contrary, they are more rapid than those producing violet light they are still invisible, but they may have a chemical or actinic effect. Now *white light* is the mixture of the visible colours of which the sunlight spectrum, or rainbow, is composed, and this white light is always, or nearly always produced by the incandescence, or glowing, of a highly heated solid body. If we put a poker in the fire, as it gets hot it radiates heat waves of low rapidity, but as yet gives no light; as it gets hotter, gradually waves of greater rapidity are given out and a dull red light begins to be seen; as the temperature rises the other colours of the spectrum are gradually added, and the light becomes whiter, until at last we have a pure white light evolved from the incandescent iron which is at very high temperature. The higher the temperature the more of the blue-violet rays, which are an important element in sunlight, are produced, and the whiter, in fact, is the light. If these blue-violet rays are absent to any degree the light has a colour determined by the predominance of the remaining colours of the spectrum, and is yellowish or reddish in its tone. What we desire in artificial illumination is pure white light, rich in blue rays like the sunlight, and, in order to obtain this, we must have our incandescent solid body at the highest possible temperature. Look for a moment at the coloured papers which are hung on the wall in front of you. Why does *this* paper appear red to our eyes? It is because the nature of its surface is such that it practically stops all but the red rays which fall upon it from this white light which is illuminating it, and reflects only these red rays to our eyes. A similar explanation tells us why *this* other paper is blue, and *that* other one is green. In order to see them in their true colours it is necessary to illuminate each with light which contains plenty of that particular ray which it has the property of reflecting. If, for instance, I illuminated *this* blue paper with light which contained no blue rays it could not reflect any rays at all to our eyes and would appear absolutely black. Let us try the effect of illuminating this row of variously coloured papers by a light which is rich only in yellow rays. I easily produce such a light, you see, by burning some spirits of wine on cotton wool sprinkled with

salt. Notice how different the colours appear from what you saw a few moments ago. Here are two colours which are apparently so nearly alike that they might be considered a good match. But now let me illuminate them, as I proceed to do, by a burning magnesium wire, the pure brilliant white light of which comes from the incandescent oxide of magnesium which is being formed. How brilliant and true the colours are now! One of these two colours which you just now thought were so nearly alike is really, as you see, a beautiful blue, and the other is a brilliant green. After this you will understand how necessary it is, for instance, when ladies visit the draper's, that the coloured fabrics which they are selecting should be illuminated by as pure a white light as possible—the comparatively yellow ordinary gas-light giving a very imperfect rendering of the various tints.

And now, with a view to studying what really goes on in a gas flame and how the light is produced, let us first consider what are the constituents of which coal gas is composed. Ordinary London gas generally contains about 52 per cent., or a little more than half its bulk, of hydrogen; 34 per cent., or a little more than a third of its bulk of marsh gas, or methane, as it is called—a light hydro-carbon; and about 4 per cent. of heavy hydro-carbons to which, though so small in quantity, the illuminating effect is almost entirely due; the remaining 10 per cent. being composed of carbonic oxide, carbonic acid, nitrogen and oxygen, all more or less objectionable components of an illuminating gas. The hydrogen and methane, which together compose about 86 per cent. of the bulk of the gas have high thermal values, but practically no intrinsic effect as illuminants; their chief function seems to be to raise heat by their combustion sufficient to decompose the small proportion of heavy hydro-carbons which are present and to render incandescent the carbon which these latter contain.

Now I think it is time to give a little attention to the structure of an ordinary gas or candle flame. Let us look at this flat flame issuing from an ordinary No. 6 "Bray" burner. There are evidently two visible zones into which the flame may be divided. The lower zone nearest the burner, and which gives little or no light, is usually called the zone of no combustion—in it the hydrogen is only just beginning to burn. In the light-giving zone above it we have the hydrogen burning with the oxygen of the air with which it has come into contact, and the heat thus evolved is rendering the carbon particles incandescent or white hot. The carbon is not yet burnt because the hydrogen has a greater affinity for the oxygen and has, as it were, to be accommodated first. Higher up there is a third zone which is invisible. By the time the constituents of the gas have reached this zone the hydrogen has been satisfied with its proper amount of oxygen, and the carbon is now being accommodated and is burning. This invisible zone, in fact, is generally the hottest part of the flame. Let me show you that in the luminous zone the carbon is really unburnt. I plunge this cold white saucer into it and bring the unburnt carbon out as soot. Moreover, I could burn this soot off again by plunging it into the invisible zone at the top of the flame where there is a very high temperature and an excess of oxygen.

What I have just given you may be called the popular description of the theory of the gas flame. It is not by any means a full, or even strictly accurate description. What really goes on in a gas flame is still a subject of scientific controversy. The modern and more accurate theory, for the development and publication of which we are largely indebted to my colleague, Professor Vivian Lewes, may be roughly stated thus:—On the gas issuing from the burner the hydrogen, due to its lighter density and greater diffusive power, burns at first at the edges of the non-luminous zone, evolving considerable heat as it does so, while the central body of that zone contains gases as yet unburnt. As the temperature of the flame rises, as we go higher up, the heavier hydro-carbons decompose into acetyline. Higher up still in the flame, and under the influence of the greater heat, the acetyline decomposes into carbon and hydrogen, and the solid carbon particles are rendered incandescent. This incandescence is the more intense in consequence of a curious property of acetyline. Most substances, on decomposition, absorb heat, or are exothermic, as it is called, while acetyline appears to be endo-thermic, that is to say, it gives out heat when it is decomposing. Thus the temperature of the carbon particles, set free by the decomposition of the acetyline, is further raised by the heat which is given out at the instant of their being evolved, and the brilliance of the illuminating zone is in this way enhanced. Higher up still in the flame the carbon itself is being burnt, and ceases to exist as solid particles capable of radiating light, and, although the heat here is intense, there is no illuminating effect.

Now we will turn to the Bunsen or atmospheric burner. It differs from the ordinary burner in that the requisite amount of air, as you know, is previously mixed with the gas before it comes to the point of combustion; the carbon does not have to wait, so to speak, till the hydrogen is satisfied, but each burns at once, having plenty of oxygen in its neighbourhood. There are in the Bunsen flame no solid carbon particles unburnt and which are being rendered incandescent. That is the reason why, as you see, it gives us no light. If I supply this deficiency of solid unburnt particles by putting into the flame a refractory substance, such, for example, as a delicate Welsbach mantle, we have now something which can be rendered incandescent by the heat of the flame, and you see the brilliant light with which we are, most of us, now familiar. I may notice in passing that the total heat evolved by the burning of a certain quantity of gas in the Bunsen burner is precisely the same as that which is given out when the same quantity of gas is completely burnt in an ordinary burner. This is not always clearly understood.

Now let us consider some of the principal causes which affect the brightness of the illumination obtained from our gas burners.

(1.) There is the question of size. This little burner, a common No. 1 "Bray fish-tail" is a very inefficient one, for, while it is burning nearly 3 feet of gas per hour, it is giving a light of only about 1½ candles, or a miserable half-candle power for every cubic foot of gas consumed. The explanation of this inefficiency is a simple one. You know that if we make two holes in a water pipe, one a very small one

and the other considerably larger, the water flows slowly out of the larger hole while it rushes rapidly in a thin stream out of the smaller one. It is just so with gas. Under ordinary pressures in the pipe the gas flows out of the two tiny holes in the small burner at a rapid rate and mixes itself so intimately with the air that it is almost like a Bunsen burner, and therefore gives very little light. On the contrary, the flow of gas from the larger holes of this No. 6 burner before you is a gentler one, and there is less mixing with the air, and we get a satisfactory illumination. The larger burner is about four times as efficient as the smaller one, because while it consumes only double the amount of gas it is giving about eight times as much light. It appears, therefore, that small lights are relatively extravagant, and this is really so, excepting when the gas is exceptionally rich, which is never the case with ordinary London gas, or when the pressure is extremely low. If we can by any device succeed in checking the velocity of this out-rush through the small holes or the thin slit of a small burner, we may considerably improve the illuminating power. The little cap which I hold in my hand, and which can be bought for a penny, is simply a burner with a large slit and is adapted to fit over the small Bray burner. I place it over this extravagant little "No. 1" and it quite doubles the amount of light, as you see, without increasing the quantity of gas burnt. The theory of its action is simply this:—the gas rushing violently out of the small holes of the little burner is caught in the cap above from which it flows slowly out of the larger aperture; thus the air-mixing is largely prevented or the "Bunsen" effect is reduced, and a much better light obtained. A fitting like this cannot, of course, produce anything like the same increase of illumination if applied to a large burner from which the flow of gas is already slow enough.

There is another reason why small burners give relatively less light in proportion to the quantity of gas they burn: it is because their flames offer comparatively more radiating surface, which keeps their temperature lower, and, you know that for intense illumination we want as high a temperature as possible. A curious illustration of this I will now show you. Here I have two small lights burning; they are from No. 1 Bray burners. Each by itself gives, as you see, a very poor light, but when I put them close together, making a duplex burner, allowing the two flames to coalesce into one thicker flame, you see that the total illumination is more than doubled. Burners have been constructed on this principle and put on the market under the title of duplex burners; they are simply two little burners combined on a single mount and are really fairly efficient, but the principle of their construction is based on a fallacy. It does not follow that because allowing two flames to coalesce gives increased illumination, it is therefore wise to construct a burner by putting together two small ones which are each terribly inefficient. If we burn the same amount of gas in a well constructed single burner, such for instance as a "Bray Special," we get quite as much light per cubic foot of gas as we can on this, once much advertised, duplex system.

I have told you, I think, that the efficiency of a good sized ordinary Bray burner is about 2 candle power for every cubic foot of London gas

consumed per hour; we may even reach as much as 2½ candle power with some of the largest sizes in use. In another form of burner, the Argand, where the air supply is controlled by a chimney, a higher efficiency, up to 3·2 candle power per cubic foot, is realised. The burner before you is known as the "London Argand"; it is the burner used in the tests of London gas, the Government requirement being that when 5 cubic feet of gas, as supplied by the London companies, are burnt per hour in a lamp of this type, it shall give an illumination of 16 standard spermaceti candles.

(2.) The material of which the burner is made has some influence on its efficiency. The old iron burners formerly used were bad, because iron, being a conductor, abstracted the heat and reduced the temperature of the flame, thus diminishing the illuminating power. All modern burners now have non-conducting tops, generally of steatite, to prevent loss of heat in this way.

(3.) The pressure of the gas supply is an important factor in the illuminating power, for high pressure may evidently cause an excessive rate of flow of the gas into the air. Pressure therefore, beyond an amount, generally equivalent to a height of about three-quarters of an inch or an inch of water, must be checked by mechanical means. Gas governors are in use for this purpose, the principle on which they act being exceedingly simple. If the pressure of the gas passing through is too great, it lifts a carefully balanced valve and automatically closes the aperture from which the gas is emerging. We may control our gas supply in this way, either at the meter or by simple little governors such as the very inexpensive but effective one which I have here, at every gas jet. We can thus effectually prevent any abnormal out-rush of gas from the burner such as results from a gas company giving us, as they sometimes do, a two-inch or three-inch pressure, and which produces the well-known roaring of a gas flame with its extravagent consumption of gas and comparatively poor light, due to the "Bunsen" effect.

(4.) Another cause of poor light at the burner is the poverty of the gas itself. For good light we require incandescent carbon, and therefore we cannot expect satisfactory light if there is too little carbon in the gas. London gas companies have considerable difficulty in sufficiently enriching their gas to the standard of 16 candle power. Formerly a certain admixture of cannel-coal was used which gave a higher proportion of carbon in the gas than ordinary coal alone. Cannel-coal, however, is now very scarce, and the gas companies obtain the necessary enrichment by other means, such as the addition of a certain amount of the vapour of benzine, or of gas obtained by the "splitting," as it is called, of petroleum oils.

The "albo-carbon" system of enrichment at the burner itself, which was introduced some ten years ago, has had a considerable amount of success. You have a burner before you. This chamber contains a quantity of naphthaline or "albo-carbon" as it is called, which is one of the solid products of the distillation of coal, and when the gas has been lighted at this small No. 1 burner, the heat after a time melts and vaporises the naphthaline, which is very rich in carbon, and the gas, in passing through the chamber, takes up a portion of the naphthaline

vapour, and the illuminating power, as you see, is very much increased. Only a small burner, such as No. 1, may be used; otherwise, as the gas is so rich in carbon, the flame may smoke badly unless a special air supply be provided. Albo-carbon burners, properly managed, are very efficient, as much as 6 candle power being obtainable from each cubic foot of, thus enriched, London gas burnt per hour, which represents an efficiency nearly 100 per cent. higher than that given even by the London Argand. Of course there is the cost of the naphthaline to be taken into account, but that is comparatively small. But if the burner be too large for the air supply the flame will readily smoke, with the usual unpleasant effects in the room and the necessity for a more frequent white-washing of the ceiling.

And now we come to "Regenerative" gas lighting, for the principle of which we are primarily indebted to the late Sir William Siemens who introduced the system of utilising waste heat in his regenerative furnaces. These furnaces, as you know, have by their economy of coal saved millions of money to this and other countries. In them, as you are aware, the hot gases are made to pass through intricate flues, to which they impart their heat which would otherwise be thrown away. When a flue is sufficiently hot the products of combustion are diverted into another similar flue and the air supply for the furnaces drawn through the one which had just been heated, thus conveying again to the fire the heat which would ordinarily have escaped, with the result that a much more intense combustion is produced. The principle of a regenerative lamp is precisely the same. The heated products of combustion pass through passages in the body of the lamp above the flame which, as in the small regenerative lamp burning now before you, is exceedingly hot, and the air supply to the flame is drawn through other passages through the same heated material. Thus, instead of the flame being fed by the cool air of the room, it is supplied with air which is already at a very high temperature, the result being that the incandescence of the carbon in the flame is far more intense than if the temperature were kept down, as it usually is, by a cold air supply. In this way the intrinsic illumination of ordinary London gas can be doubled or trebled. Frankland was probably the first to introduce the regenerative principle into gas lighting. He applied it with some success to an Argand burner by means of a double chimney. For the modern developments of the system we are indebted to the successive labours of Grimston, Bower, Thorpe, Wenham and Thomas, and also to a very great extent to Siemens. A brilliant example of the Siemens regenerative lamp is now burning in the centre of this hall, and may be credited, I think, with an illuminating efficiency, vertically beneath it, of at least 10 or 12 candle power per cubic foot of gas. The average all-round efficiency of a moderate-sized regenerative lamp may be taken at about 6 candle power per cubic foot. This, compared with ordinary open burners, you will admit, represents a very marked advance in the economy of gas lighting.

Probably the regenerative lamps of the "Wenham" company have had the greatest commercial success, but that company, like many others, has been practically ruined by the latest development of gas lighting, the "Welsbach" or incandescent system, to which I will

now ask your attention. We have seen that in the ordinary system the carbon in the gas, by the incandescence of which light is obtained, being combustible, has constantly to be renewed. It would be an obvious economy if, instead of deriving our light from incandescent carbon, which is destroyed immediately after it has come to be useful, we could insert in the flame some refractory substance which could be made to glow by the heat of the burning gases and not be consumed. If we were to do this we should be only utilising the heat-giving value of the gas, and might do almost as well without the expensive heavy hydro-carbons. The lighter and cheaper constituents of the gas have high heat-giving values, and we could utilise the poor gas to raise to incandescence, by the heat of its combustion, this refractory substance which, once introduced, might remain there practically for ever. Some 14 years ago efforts were made to realise this by the introduction of a mantle of fine platinum gauze into a Bunsen flame, none of the light-giving value of the gas being used, but only the thermal value being utilised to render this mantle incandescent. This was the principle of the "Lewis" incandescent light, which had for some time a certain amount of practical success. It had two disadvantages however: (1) It required a high pressure air supply which had to be obtained by mechanical means; and (2) it was found that after continued use the mantle deteriorated in consequence of the formation of carbide of platinum. The best installation I ever saw of this light was at the Gower Street railway station, where the requisite pressure was obtained by an auxiliary engine, but after running for about a year it was removed. For household purposes, of course, the necessity for a pressure four or five times as great as that supplied in the mains made the Lewis system practically useless. I have myself used a burner of this kind with some success, with the help of a specially induced draught, but it was more interesting as an experiment than of practical utility. Similar difficulties were experienced with the "Clamond" light, which was practically the "Lewis" light with a mantle of fine magnesia threads in the place of the platinum gauze, and no more success attended the introduction of this system than the Lewis light experienced.

Shortly after the practical failure of the Lewis and the Clamond systems had been proved, Auer von Welsbach produced a mantle which has now at length, after eight or nine years' steady improvement, met with a grand success. Although an enormous price, I believe something like £200,000, was paid by the English company for their patent in this invention, yet, on account of the extreme delicacy and want of permanence in radiating power of the mantles first made, the system met at the outset with so little success that the company was at one time upon the verge of bankruptcy. At this critical time, however, an improved mode of manufacture and a better formula for the composition of the material of the mantle were evolved, and a marked improvement rapidly brought the new light into favour with the result that the incandescent system is now a great commercial success and is admitted to be far the most economical and brilliant method of gas lighting.

Let me tell you in a few words how the mantle is made. A small cotton sack, or little stocking, I may call it, is first knitted, and then

steeped in a solution of nitrates of thoria and ceria. It is then dried and the whole of the cotton is burnt out by a powerful Bunsen flame, leaving behind only a very delicate skeleton composed of thoria and ceria in the place of the cotton threads, which, after further heating, or "seasoning" as it is called, and a dipping in collodion in order to stiffen it temporarily for transit purposes, is the commercial mantle as now issued. This collodion is first burnt off when the mantle is mounted for use, and then the heat of the Bunsen flame, over which the mantle is suspended, raises the delicate filaments of infusible oxides to the white and brilliant incandescence which you see now before you. The exact composition of the Welsbach mantle is 98 per cent. of thoria and 2 per cent. of ceria. Thoria and ceria are two of a series of rare metallic oxides which includes also zirconia, yttria, lanthana, alumina, etc., all of which have been tried for incandescent mantles. The supply of thoria, which is the chief constituent of the Welsbach mantle, is an exceedingly limited one. It is derived chiefly from a complex substance called monazite, which can be found in North Carolina and a few other isolated places.

The function of the mantle, of course, is to absorb the thermal energy of the Bunsen flame and to transform as much of it as possible into radiant light. We may judge of the efficiency with which it does this as compared with the corresponding efficiency of an ordinary gas flame from the experiment to which I now call your attention. I have here a small No. 2 Bray burner and a Welsbach burner arranged to burn alternately off this experimental meter, which shows you that they are consuming the same amount of gas, namely 3·8 cubic feet per hour. Unfortunately my gas pressure is so deficient, as I have told you, that you do not see what you ought to see, but still it is evident that the light given out by the Welsbach burner is considerably greater than that from the Bray burner. With a proper gas supply it would be easy for you, by your personal observation, to approximately verify my statement that the light given by the incandescent mantle is eight or ten times as great as that given by such a common burner although the cost per hour is the same for each.

Of course the objection to the Welsbach system is the extreme delicacy of the mantle and its liability to accident. With moderately careful management I do not find that this is a serious consideration. Let me give you two or three practical "tips" derived from my own eight years' household experience of this light. (1) Do not allow it to have too much gas: if you do, probably the gas will not be all consumed and some carbon may be deposited on the top of the mantle. After lighting the burner you should turn the gas slowly off until the brightest illumination is obtained. With more gas on it will nearly always be found that less light is given. (2) Should the mantle be blackened by carbon at the top, due to the gas having been too full on, the deposit can be easily got rid of by simply turning the light down till the mantle is only about one-third filled with gas flame. The carbon will then be at the top of the flame and will be gradually oxidised or burnt away. (3) Should the mantle, from no apparent cause, fail to give approximately its original amount of light, it is probable that dust is covering the small holes through which the gas emerges in the burner. If the

mantle be carefully taken off, or even the upper part of the burner, including the mantle, simply removed, and the rest of the burner vigorously blown through, this evil will in all probability be effectually cured and the light will be then as good as ever. (4) Should a burner be in any exposed place where draughts are likely to break the chimney, a mica chimney should be used, which, though it absorbs perhaps 10 per cent. more of the light than a glass chimney does, is practically imperishable. With these hints I do not think any one should experience any more difficulty in the management of the light than my own domestics do, who have thirteen or fourteen burners in daily use.

The Welsbach light is a purer white than that given by ordinary gas burners, being particularly rich in the blue rays and therefore more like sunlight in its power to render truly the proper colours of pigments and coloured bodies generally. This is a valuable set-off against the objection made to it sometimes, that it is more trying to the complexion than the comparatively yellow light of ordinary gas burners. It can, of course, be tinted or softened to any amount by the use of opal or coloured globes or chimneys.

The average efficiency of a Welsbach mantle may be taken as from 12 to 13 candle power per cubic foot of gas per hour. Thus we may say that at a single stride the efficiency of gas-burning has been doubled by this new system as compared with the best results which were previously possible, and an efficiency about six times as great as that usually obtained from good ordinary open burners is now within the reach of everybody.

I would like now to turn your attention to the latest novelty in gas lighting. You remember that when we were discussing the right and the wrong way of using gas for cooking, it was mentioned that if a burner were badly used the poisonous gas acetyline might be evolved from the flame. Now this acetyline gas has a virtue as well as a vice, for it possesses a very high intrinsic illuminating power, and lately a good deal of attention has been directed to its properties as an illuminant or as an enricher of ordinary coal gas by Professor Vivian Lewes and others. We have here a small gas holder containing this acetyline gas, and I am now burning it in an ordinary flat flame at a very small fish-tail burner which passes only about a half of a cubic foot of gas per hour. Acetyline is so rich in carbon that it can only be burnt, without smoking, at very small burners, unless a special air supply be provided. You observe the brilliant white light which this little jet is now giving us. The intrinsic illuminating effect is about 48 candle power per cubic foot of gas burnt—an extraordinary result and we naturally ask the question:—Can this gas be economically used for practical illumination? Up to the present there seems to be little encouragement in this direction, because, apart from the question of the cost of its production on a commercial scale, which is at present a much debated point, the exceedingly poisonous nature of acetyline, and even its very richness in carbon, necessitate extremely careful handling of the gas and adjustment of the burner. It has been suggested that it might with advantage be used as an enricher of ordinary coal gas, but in this respect it has proved not so economical as oil gas or benzine.

Acetyline is evolved by the action of water upon calcic carbide, and calcic carbide is produced by fusing together lime and coal dust in an electric furnace. The resulting carbide is a heavy dark grey substance, a pound of which will yield a little more than five cubic feet of acetyline, which gas can be evolved from the carbide by simply allowing water to drop upon it, in which way, in fact, the gas in this holder has been generated from the carbide in a small flask. We have had to be exceedingly careful to prevent leakages, as the slightest trace of acetyline in the air is peculiarly objectionable on account of its pungent and disagreeable odour.

One difficulty connected with the practical use of acetyline is its liability to combine with copper and some other metals with which it might come into contact, but really the question as to whether it will ever be largely used is that of the cost of the manufacture of the carbide. Where power is cheap, as at Niagara, for instance, we are told that it may be produced at about £3 per ton, but there is little hope, I think, that it will be obtainable in England at less than perhaps £6 or even £10 per ton, at which price acetyline will hardly be able to complete with existing methods of illumination, except perhaps under special circumstances where coal gas cannot be obtained, and for portable lights, to which latter it may be well adapted, inasmuch as the gas can be easily compressed into the ordinary iron cylinders, or indeed may be condensed into a liquid if a pressure of 21½ atmospheres be applied. Under any circumstances considerable care will have to be taken in the management of it if pure acetyline gas is to be used as an illuminant.

Within the limits of a single lecture, of course, it is impossible to include a proper discussion of the merits of petroleum and electricity as lighting agents as well as those of gas, to which I have chiefly devoted my attention. I propose later on to show you comparative estimates of the economies of these three illuminants, and I fear time will not permit me to do much more; but I will just call your attention to the latest departure in petroleum lighting, viz.:—a very clever and apparently successful design of a petroleum lamp on the regenerative principle. The lamp now hanging before you, and which has been burning brilliantly until I had to extinguish it, as you remember, before the use of the lantern, has been submitted to me by the "Gloria Wickless Lamp Company." Up to the present in my hands it has certainly given a very high efficiency. I do not propose to quote figures in connection with it until I shall have given the lamp a three months' practical test. I may say, however, that it appears to me to be a very great advance on anything yet produced in this direction, and to be capable of providing a brilliant white light of from 100 to 130 candle power at a very trifling cost for oil. It has the drawback, however, that it requires a few minutes' careful attention when lighting it. The principle is a simple one: the oil falling drop by drop from a receiver at the top of the lamp into a chamber which is heated by the flame burning underneath it, is turned into gas, which, issuing from a number of small burners arranged in a circle below, gives an exceedingly bright light. The lamp is really, therefore, a gas lamp which automatically generates its own gas supply from liquid petroleum, and the regenerative effect which gives the intense whiteness to the

light is produced by conducting the air supply to the flame through the heated body of the lamp as in the ordinary regenerative gas system. Of course it is obvious that, as the oil falls in the receiver, the diminution of the pressure head will cause a less and less rapid flow of oil, and we might expect the flames gradually to diminish in size. This does happen, but to a small extent only, because the receiver, as you see, is of large area, but of very small depth. Some little care, of course, must be given to the adjustment of the flames, but I have found no practical difficulty at present and can only regard the lamp as one promising to be of value in careful hands, at any rate, where gas cannot be obtained.

I now propose to ask your consideration of some figures which will indicate the efficiencies of the various systems of lighting and their comparative economies. I may mention that the tables which I propose to show you represent the results of careful and prolonged tests made by myself, and for which I take the entire responsibility.

(1.) I will call your attention to what is now on the screen, showing you the efficiency of the various gas burners:—

EFFICIENCY OF VARIOUS GAS BURNERS.

	CANDLE POWER Standard Candles.	CONSUMPTION Cubic feet of Gas.	EFFICIENCY Candles per cubic foot.
Common "Bray" No. 2	3	3	1
" " " 5	9	6	1·5
" " " 7	14	7	2
Bray's "Special" No. 9	20	8	2·5
"London" Argand	16	5	3·2
"Wenham" Regenerating No. 2. Tested at 45°	67	11	6·1
Albo-Carbon	20	3	6·6
"Welsbach" Incandescent	48·2	3·8	12·7
Gas Engine, driving dynamo and 100 electric incandescent lamps	1600	200	8

Without alluding to each item, I may remark that the figures show, as I have before pointed out, that small open burners are unprofitable, the common "Bray" No. 2 giving an efficiency of only 1 candle per cubic foot of London gas burnt per hour, while the best form of a "Bray" burner is credited with 2½. Notice also, please, that the regenerative system, illustrated by a No. 2 lamp tested at 45°, gives an efficiency of about 6·1 candles, which may be taken as a good all-round value. The Welsbach incandescent burner gives, as you see, an efficiency of 12·7. This is the average result of a large number of mantles tested and

compared with a Pentane standard. The more common ordinary burner, No. 5 "Bray," being credited with only 1·5, you see that the Welsbach mantles are at least 8 times as efficient.

The last item on the screen is an interesting one. Treating the gas engine as a gas burner giving light through the means of a dynamo and incandescent electric lamps, you see that the efficiency is 8 candle power for each cubic foot of gas burnt per hour in the engine. Thus, if we reckon only the cost of the gas consumed in the cylinder, a gas engine is a more efficient light producer than any other gas burner except a Welsbach.

(2.) The next table now on the screen shows you the result of tests to determine the comparative effects of an ordinary burner and the Welsbach as far as vitiation and heating of the atmosphere are concerned—

VITIATION OF THE AIR AND HEAT EFFECTS.

Actual Measurement after 1 hour in a room of 3200 cubic ft. capacity.

	ORDINARY BURNER Bray's Special No. 6.	WELSBACH INCANDESCENT
Candle Power	14	42
Consumption ... ... cubic ft. of gas per hour	7·4	3·2
Increase of Carbonic Acid ... ... per 10,000 c. ft. of air	15·1	8
Ditto—per candle power	10·8	1·9
Heating Effect (proportionate) ... ... per candle power ... ... Theoretical	7	1
Ditto ... ... per candle power...by actual measurement	6·3	1

We may summarise the results by saying that, light for light, it shows that less carbonic acid is evolved from the Welsbach burner than from ordinary burners in the proportion of 1·9 to 10·8, or less than 1 to 5. At the same time the heating effect of the Welsbach is shown, by actual measurement, to be less in the ratio of 1 to 6·3.

Of course the heat evolved in any case must be exactly proportional to the quantity of gas actually consumed (although unfortunately this is not always understood) and therefore the comparative heating effects of the two systems of burners ought to have proved to be in the exact ratio of their consumptions. A practical test applied to the atmosphere of an ordinary room, however, would necessarily show some divergence from the true ratio on account of the circulation of the heated air and its passage to and from the outside of the room. The figures before you prove the Welsbach to be not only a brilliant light but a cool light, and it is also a far more healthy light than that obtained from ordinary gas burners.

(3.) The table on the screen to which I now direct your attention gives you the relative annual cost of producing a light of about 48

candle power, sufficient for an ordinary-sized room, by various systems, and taking into account all such incidental expenses as are due to repairs of lamps, chimneys, renewals of mantles, etc.

DOMESTIC LIGHTING.

Annual Cost of maintaining a light of about 48 candle power—2000 hours' burning. Results of tests under practical conditions.

GAS ... "Argand"	Three 16 candle Lamps consuming each 5ft. of gas per hour.	30,000 cubic ft. of gas at 2/6 per 1000 cubic feet 75/– Renewal of chimneys 3/–	78/–
„ ... "Wenham" Regenerating	One Small "Wenham" consuming 7 ft. per hour.	14,000 cubic ft. of gas ... ... 35/– Repair of Lamp, &c. 5/–	40/–
„ "Albo-Carbon"	Two No. 2 "Bray" Burners consuming each 3½ ft. per hour, carburetted with Naphthaline.	14,000 cubic ft. of gas ... ... 35/– 52lbs. of Naphthaline at 3d. ... 13/–	48/–
„ ..."Welsbach" Incandescent	One new "C" Lamp, giving 12 candle power per cubic foot.	8000 cubic feet of gas ... ... 20/– Renewal of Mantles, three at 1/3 ... 3/9 Renewal of chimneys 1/6	25/3
PETROLEUM. Large Lamp	One 48 candle "Vulcan" Lamp burning 1 gallon in 28 hours.	Oil consumed at 6d per gallon ... 35/9 Chimneys, Wicks, &c. 2/3	38/–
„ Small Lamps	Four 12 candle Lamps each burning 1 gallon in 84 hours.	Oil consumed ... 47/7 Chimneys, Wicks, &c. 2/5	50/–
ELECTRIC Incandescent	Three 16 candle Lamps absorbing each 64 "Watts."	Cost of Current at 6d. per Board of Trade unit (1000 Watt-hours) ...192/– Lamp renewals, 8 at 1/6 ... ... 12/–	204/

Note.—The figures above apply to the use of the various illuminants under ordinary household conditions. Careful laboratory tests, of course, give better results.

You notice that while the Argand gas burners would cost 78s. a year, the "Wenham" lamp would be cheaper at 40s., and "albo-carbon" burners at 48s., while the "Welsbach" incandescent would supply us with the same light for 25s. 3d. A large "Vulcan" petro-

leum lamp would cost 38s., and if we were to decide to get the same light in electric lamps, supplied by current taken from the mains at 6d. per unit, it would cost us annually 204s., or eight times as much as the same light upon the "Welsbach" system.

(4.) And now we come to the last table which I propose to show you. It is a comparative estimate of the cost of lighting by electricity and gas on the assumption that the electric current is generated by our own gas engines.

COMPARATIVE ESTIMATE OF COST OF LIGHTING BY ELECTRICITY AND GAS.

		30 Lamps.		300 Lamps.	
ELECTRICITY. Outlay on Plant.	Gas Engine, 2-H.P. Nominal	£80	£205	£300	£1145
	Dynamo, 50 Volts, 40 Amperes	35		160	
	Lamps (16 candle) Switches, Wires, &c.	20		150	
	Accumulators	60		460	
	Fitting	10		75	
Annual Expenditure (1500 hours.)	Renewal of Lamps, 80 at 1s. 6d.	£6	£65	£60	£367
	Depreciation—10% on £200	20		10	
	Labour	20		40	
	Gas and Oil for Engines ...	12		120	
	Interest on Plant, 4% on £175	7		39	
GAS. Annual Expenditure.	Good Ordinary Burners, giving 2½ candle power per c. ft. of gas 288,000 cubic feet at 2/6 per 1000 Depreciation, Repairs, Interest, &c.		£40		£400
	Welsbach Incandescent, giving 12 candle power per c. ft. of gas 60,000 cubic feet of gas, Depreciation, Renewals, &c.		£14		£140

Note.—If Electricity is supplied from public mains at 6d. per Board of Trade unit, the annual cost, at 4 Watts per candle power, including renewal of lamps, will be ... .. £78 and £780

I direct your special attention to the annual expenditure necessary in order to maintain thirty 16 candle electric lamps. You see that it amounts to £65. Good ordinary gas burners would give us an equal light annually for £40 and "Welsbach" incandescent lamps for £14. If, however, the electricity had been supplied at 6d. per unit the annual cost would have been £78.

With a larger installation of 300 lamps, the annual cost ot the electric light made by our own gas engines would be £367, whereas ordinary gas burners would cost us somewhat more, or £400, and the "Welsbach" incandescent would cost only £140. Generally we may say that, with large installations, electricity, locally generated, can beat the gas if ordinary burners are used, but it seems still to fail as a competitor in the point of economy with the modern "Welsbach" system.

And now allow me to conclude with a few words on the competition of electricity and gas and the prospects of its ultimate issue. The special advantage hitherto claimed, and justly claimed, for electric lighting has always been in its non-pollution of the atmosphere. But now that we can get a brilliant gas-light, the deleterious products of which are so small as to be almost negligable, the special pre-eminence of electricity in this respect exists only in a much smaller degree. Electric incandescent lighting, except in such special cases as where, for instance, cheap water power is available, is, as we have seen, much more expensive than gas, and there seems little prospect of its being cheapened to any great extent. The best combination of engine and dynamo yet constructed has not succeeded in transforming more than one-tenth of the heat value of the coal used into current energy, and only five per cent. of this is transformed into light in the lamps. It would appear at first sight that there is here a large and promising margin for improvement. As, however, the efficiency of a modern dynamo is already as high as 95 per cent. little advance can be looked for here, and the question of the cheapening of the electric light resolves itself, therefore, mainly into two problems. Firstly, one for the engineer, to get more horse-power out of a given quantity of fuel, and secondly, one for the physicist to get a better refractory filament which will transform a larger proportion than five per cent. of the current energy into light. Practical considerations, and a study of thermo-dynamic laws alike seem to set a very narrow limit to the advance we may expect in the production of horse-power from fuel, and we hardly dare hope for a much higher duty than that we now get from the very best engines, viz, 1 horse-power for every 1½lbs. of coal consumed per hour. More hope lies, I think, in the direction of improvements in the lamps themselves, and although little or no advance has been made in the last five or six years in this respect, yet a much better light-radiating filament than the present carbon thread may some day be discovered. Side by side, however, with any possible progress in this latter direction, we may expect improvements in the toughness and light-radiating power of the mantles used in incandescent gas lighting. Marked advance in this respect has been made of late, and I cannot help thinking that the incandescent gas system will easily retain the

great advantage it at present has over electric lighting on the point of economy.

The future of gas lies, however, not only in the direction of lighting, but also in its extended use as a heating agent and as a source of power. Already it is far the cheapest, cleanest and most manageable fuel for cooking, and it is making such rapid strides as a source of motive power that, in the opinion of the best judges, the gas engine is destined to be the engine of the future.

The matter of the residual products of gas making is an important feature. The products of one ton of coal carbonised by a gas company are approximately 10,000 cubic feet of gas, 10 gallons of tar, 25 to 30 gallons of ammoniacal liquor, and 12¾ cwt. of coke. From the tar and ammoniacal liquor no less than 44 different substances are now extracted which are invaluable in medicine, in the arts and manufactures, and in agriculture. They include many of the most valuable dyes, anti-septics, and fertilisers, and are as useful as the gas itself, and it is considered that the cessation of the production of these articles would be infinitely more serious than the stoppage of the gas supply.

Apart from lighting, therefore, the future of the gas industry is assured, and it must endure as long as workable bituminous coal-fields exist. Should the London Gas Companies succeed in the effort which they are now making to influence the Board of Trade to sanction the reduction of the illuminating standard of gas from 16 to 14 candles, the great expense now attending the enrichment of the gas necessary to give it the extra 2 candle power above the natural value of about 14 candles will be saved, and gas companies will be able to largely reduce the price to the consumer without seriously impairing the illuminating power. This should result in an enormous stimulus to the use of gas for cooking, heating, and motive power, and might even lead to the displacing of coal in generating stations for electric lighting. Sir William Siemens used to say that it was a scandalous waste to burn bituminous coal as we do in our fire-places and furnaces, so much of the valuable products passing away unburnt to poison the atmosphere and lower the vitality of the inhabitants of our great cities, and giving that pestilential and destructive character to the fogs which envelop us in dirt and darkness. Sir William Siemens was, of course, right. All bituminous coal should be separated into its gaseous and other parts, and each applied separately to its special purpose. No doubt, in the near future, the laws governing our health will be more generally appreciated than they are now, and, under the stimulus of a benevolent legislature, this will be carried out, and we may even look forward to the time when dwellers in towns will enjoy a pure atmosphere, subject only to colourless fogs as harmless as the mist of the mountain, and will live in houses and work in factories comfortably warmed and ventilated by gas; brilliantly lighted by gas on the incandescent system or by electricity generated by gas engines, while they will enjoy good food cooked by gas in spotless kitchens where the tradition of the smutty and wasteful coal ranges of former years will be a reminiscence of an ignorant and barbarous past.

DISCUSSION.

THE CHAIRMAN.—I do not think that any of us would have guessed that Professor Lambert was under any disadvantage after the delightful and brilliant lecture which he has given us. He has said that he will be very willing to answer any questions that any gentleman may wish to ask about his lecture or about any kind of lighting in which you may be interested.

PROFESSOR LAMBERT.—Within my ability I shall be glad to answer any question, and I shall welcome any enquiry which may bear upon any point that I have not made clear in my lecture.

COLONEL WATKIN, C.B.—I am sure we have all been most interested in the lecture that we have just heard, it has been most enjoyable and interesting, and at the same time most economical, as I for one shall now inspect my gas burners. I think we have all had the same sort of idea that a small gas burner was an economical one, because the cook could not turn on the gas too high; but now we find that she would be quite right in having a large burner.

I think, Sir, the subject is one of the most interesting to those of us who, like myself, are getting on in years and who are obliged to work under artificial light at night. I am sorry to find that our old friend electricity, which has done and is doing so much for us, is being ousted in that one particular sphere in which we thought it was paramount, namely illumination; but certainly my own experience of incandescent gas light coincides with that of the Lecturer in finding what a beautiful light it is. I think very few of us, without trying it for ourselves, would know really what an advantage it has over other lights. Statistics such as those given by the Lecturer, are very interesting, but do not appeal to one, in the same way as a practical trial. Anybody I feel sure, after once trying these incandescent burners, would use them in preference to the older form.

But, Sir, there is one point which is very important, and which the Lecturer has not told us anything about, and on which I should like to have his opinion, and that is the effect upon our eyes of the electric—incandescent light. I am told (and I can quite believe it from my own experience) that the income of the oculists has vastly increased since the introduction of the electric light. Why is this? My own theory is that the small filament which we get in the incandescent electric burner is so small, as compared with an ordinary gas burner, that the image formed on our retina is very small and therefore the sensitive nerves are greatly distressed, not to say ruined, by the immense amount of light concentrated on so small a space. Whether this is so or not perhaps the Lecturer will be able to tell us. We cannot change our eyes like mantles, and they are too precious to be trifled with.

One other point as regards economy I should like the Lecturer to give us some imformation about. I saw the other day an advertisement in the *Times* of a rival company who say that their burners give out more light per cubic foot of gas; that the mantles are not so delicate (and certainly the mantles are rather delicate to handle), that they will last longer, and, what is more important, that they are less than half the price. Now, if that is so, the future of gas lighting is, I think, assured, and our poor old friend, the electric light, will have to take a back seat.

REPLY.

PROFESSOR LAMBERT.—In reply to your question, Sir, about the effect upon our eyes I should regard your own explanation as a perfectly correct one. The effect on the retina, I take it, is not due only to the quantity of light which is received in the eye but to the intrinsic illumination of the image at the back of the eye. It hurts nobody's eyes to be out in the open in the diffused light of an ordinary fine day, and yet the quantity of light which enters the eyes then is

many times greater than that from an electric light close to you. I have found that even when the sun is only 20° above the horizon, and on a February day, the amount of illumination by direct sunlight is something like 2700 candles at the distance of a foot. The light from a brightly lit sky obviously causes a large volume of light to enter the eye but, being distributed over the whole retina, it does not hurt your eyes; whereas, if you look at an electric light, as you say, the image of the filament or of the carbon points in your eyes is very small, and the whole of the light is concentrated in that small image, and therefore local damage is done. With the "Welsbach" incandescent burner, the mantle being so many times larger than the slender filament of the electric lamp, the image is much larger too, and for this reason you would not expect so tiring an effect on the eye as you would from the electric light.

With regard to your other question about the "Meteor" Company (I think that is the name), I may say that when the advertisement to which you allude came out I, like everybody else, was anxious to know whether our present incandescent burners were to be thrown away and we were all to take these new ones. I tried to get all the information possible concerning the merits of this new "Meteor" but with little or no success. I do not believe that the mantles could be made to sell at the price stated, 6d., I think.

I notice, however, that the exceedingly attractive advertisement is no longer appearing in the newspapers. Whatever they may mean I do not know, but it is a fact.

Colonel Watkin.—They say they are going to supply the mantle in ten days. I have been trying to get one.

Professor Lambert.—Yes, they were full of promises. But there is one thing I would observe in connection with the name. What is a meteor? Is it not something that flashes suddenly across the firmament creating a great fuss, and then is gone for ever (laughter)? I do not know whether this is prophetic.

The Chairman.—It only remains for me, ladies and gentlemen, to thank Professor Lambert for the delightful lecture he has given us, which I am sure we have all enjoyed very much indeed (loud applause).

A SUGGESTION FOR FIRING "PUFFS" FOR TRAINING OBSERVERS.

BY

CAPTAIN C. S. VORES, R.H.A.

THE method of firing the puffs issued for training observers in horse and field batteries seems to admit of improvement, and as the greatest difficulty we have to overcome is the correct observation of fire, anything which makes the discharge of a puff more like the burst of a shell is desirable.

When fired from a peg, as at present, the powder being unconfined except by the bag, the smoke at once rises into the air and presents a very different appearance to that rising from a shell burst on graze. No doubt other officers have noticed the same thing, and the following suggestion is only made in the hope that it may be of some use to those who have not noticed it or worked out any plan for themselves.

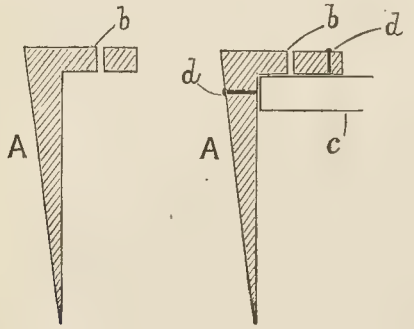
An iron tube about 5″ long and 2·5″ in diameter, open at one end and closed at the other, is rivetted to the peg. Two rivets are required, the closed end resting against the peg, and a hole must be drilled for the friction tube. This can be done by the battery farrier at a cost of about 3d. a peg.

The peg must be driven into the ground with the closed end of the tube towards the observer.

When the puff is fired, the smoke is propelled forward and gives a very good imitation of a shell burst on graze.

The head of the peg should be 4″ or 5″ above the ground.

It has been found that three-quarters of an ounce of powder gives quite enough smoke to represent the burst of a shrapnel.



A section of peg. *b* hole for friction tube.
c iron pipe. *dd* rivets.

GARRISON ARTILLERY WARFARE.

BY

MAJOR O. ROWE, R.A.

When deciding on the plan of defence of a Coast Fortress, it is essential in the first place to consider the nature of the attack to which it is liable to be exposed. This in its turn will depend to a great extent—

(1.) On the armament and resources of the fortress.

(2.) On the strength, composition and *morale* of the garrison.

(3.) On the relative value of the fortress to the attackers and defenders.

(4.) On the necessity for its destruction or capture for strategic reasons.

(5.) On the necessity for the destruction or capture of any material or ships which it protects.

In all these conditions, the question whether "the game is worth the candle" will present itself to the assailants. A modern battle-ship, cruiser, torpedo-catcher, or torpedo-boat is valuable only so long as she is afloat and in a more or less undamaged condition. They take a long time to build and repair, and once badly damaged, are not likely to take any further effective part in the hostilities, since all authorities are agreed that the next war will be short, sharp and decisive.

They represent not only a large capital sum of money, which no nation can afford to recklessly lose, but, what is more important, the command of the sea to that combatant who can last bring an effective fleet into action.

The primary object of an armed ship is to fight ships and the naval strength of a nation should not be wasted in attacking a Coast Fortress without some very good object in view, which will justify the expenditure of a fleet, if necessary. These considerations will therefore doubtless influence the Admiral of a fleet and prevent him from rashly undertaking adventures to capture another Gibraltar, simply because he has nothing better to which to turn his hand. Roving attacks of a piratical character to harass, destroy or hold to ransom weakly defended or undefensible sea-ports may be expected, when once one of the Powers has asserted its local supremacy on the sea; but at the commencement of hostilities these excursions must give place to the more

important operation of clearing the sea of the opposing ships of war. Consequently we may imagine that an attack on a Coast Fortress will be an affair of some importance and every available warship will be collected for the purpose.

When the object of the attack is the capture of the fortress, we may assume that a land force will undertake the operation, assisted by the fire of the fleet. The attack of the fleet will then only be of secondary importance, its duties being the destruction of the batteries bearing on the land attack and the engaging of as many other batteries as will compel the defender to employ a large part of his force in replying to the fire of the fleet, thus weakening the main defence.

It will hardly be possible for a fleet to so silence all the fire of a well garrisoned fortress as to be able to land sufficient men to capture it against the wishes of that portion of the garrison (*i.e.* the infantry) who have hitherto been merely spectators unless the strength of the fleet is overwhelming in comparison to that of the fortress. There would also be the risk of dangerously undermanning the fleet, should sufficient men be detached to hold the fortress when captured; a serious consideration if the fleet has to return probably some considerable distance to replenish its stock of ammunition, which will be much depleted, if the defence has been at all vigorous and tenacious.

In a word a Coast Fortress *per se* would never be attacked by a hostile fleet, there would be nothing gained by doing so.

But Coast Fortresses are built for some well defined purpose, either to protect a fleet while repairing or refitting, or to afford it a refuge from a hostile fleet, or to protect stores of coal, &c. which are essential to the efficiency of a fleet.

A Coast Fortress therefore may expect attack when there is a fleet under the protection of its guns, or it may be attacked by a fleet having local supremacy, even when no ships of war are in the defended area, either to possess itself of the stores, &c. protected by the fortress, or to destroy them and thus impair the efficiency of the opposing fleet.

If the object of the attack then be the destruction or capture of *matériel* or ships defended by the guns of the fortress, it will be sufficient for the purpose of the attack, if the fire of the defence is either silenced, kept under or avoided sufficiently, to enable that purpose to be carried out and the fleet withdrawn.

The *raison d'être* of the fortress and arrangement of the defences will serve then as a guide to anticipating the nature of the attack to which it will be exposed on the sea side; while the general dispositions of the fleet will depend on the amount of sea room at the disposal of the attackers and the conception of the Admiral in command, of the manner in which the defences are able to interfere with his own plan of operations. The attack of the fleet on a sea fortress, therefore, may assume two phases:—

The secondary attack—The artillery duel.
The primary attack—Torpedo or boat attacks.

As regards the secondary attack—This attack will be made either at "long range," from 5,000 to 3,000 yards; at "medium range,"

from 3,000 to 1,500 yards; at "close range" within 1,500 yards, or the ships will "run past" the defenders' fire when the real object of the attack is situated in rear of the defence and out of reach of the attack until the fire of the defenders is evaded.

The attack at "long range" would, as a rule, be for the purpose of dividing the attention of the defenders from the main attack proceeding elsewhere, or would be used for a bombardment pure and simple.

In these cases the attackers will endeavour to do the greatest possible damage to the defences, with the least possible chance of injury to themselves. The attack will not be pushed home unless it becomes apparent that the object will not be gained without it, or the feebleness of the defence invites the attackers to do so, and convert their secondary attack into a real one.

"Medium range" would be used when greater accuracy is required, while the position of "close range" would be taken up to enable the machine and quick-firing guns to keep down the infantry, quick-firing and machine-gun fire which would be used to repel a landing or attack by torpedo-boats.

A fortress, or a portion of it may possibly lend itself to a simultaneous attack at all these various ranges, combined with the phase of "running past;" but the probability of such a variety of attacks will depend entirely on local features. It will be evident therefore that the attackers must conform to more or less fixed rules, and that the nature of their operations and tactical dispositions will depend on the object they have in view and its importance. The strength and composition of the fleet, and the manner in which the attack is conducted will disclose their object, even if the defenders have not previously received information of the departure of a fleet with some specific purpose, from the enemy's shore.

The tactical formations of the attackers will further be influenced by:—

(*a*) The nature of their armament and thickness of armour, and the natures of the guns of the fortress with their distribution, positions, and arcs of fire, in conjuction with the 3 and 5 fathom lines and mine-fields. Generally speaking as we know all about the armament of ships as fast as they can be identified, so it may be imagined that the attackers know the numbers and natures of the guns opposed to them, their distribution and arcs of fire. The effect of the other consideration is obvious. A naval officer once remarked to me when I was talking to him on this subject, "we should run in close and pour in a heavy fire from everything we have got to fire with. It would be all over in 15 minutes." "One way or the other," I suggested, and I cannot but think that his plan would not be universally successful in capturing a fortress.

(*b*) The time at their disposal.—This consideration will only come into force when the attack is of the nature of a raid on the *matériel* or ships protected by the fortress, which must be

more daring than when the object is the capture of the fortress itself; for this last must necessarily be a long operation, and would not be undertaken till the fleet held the command of the sea, and in that case their time would not be limited.

(*c*) The character of the defence anticipated.—If the defence is likely to be weak, it would be the best policy to crush it at once; but if vigorous, then the energies of the garrison must be first worn out by harassing them from "long range," combined with frequent "close" attacks.

(*d*) The state of the weather and direction of the wind.—These are important factors. A rough or choppy sea is all in favour of the defence, since their guns are on steady platforms. The false atmosphere created by the smoke of the guns, and the manner on which it is acted by the wind, whether it hangs about the ships or batteries, may be turned to the advantage of one side or the other. At any moment a change or lull in the wind might alter the whole situation.

The main issue, however, is the vulnerability of the fortress itself. Neglecting the strength of the garrison, and the possibility of destroying the food and water supply by the fire of the fleet; we may say that given the necessary armament, the vulnerability of a fortress, from an artillery point of view, depends on the invisibility and consequent protection from fire of its batteries, range-finding arrangements, command posts, and communications.

It is obvious that a target lends itself to be aimed at and struck; consequently a fortress whose works offer no target is in a much better position for defence than one whose works do so, and its vulnerability is decreased thereby. Its vulnerability will further depend on the disposition of its works and the armament mounted therein; whether they give each other mutual support, or are so far apart as to invite attack in detail from want of it. But guns should not be dotted singly here and there with emplacements "freckling" the face of the fortress in pursuit of invisibility; rather should they be placed in groups of the same calibre, and in as many groups as may be considered advisable, with due regard to invisibility of position. The effect of dotting guns singly here and there may be well illustrated by the fact that one groom can very well look after two or three horses in one stable; but if they are in different stables, he cannot possibly look after them so well, and there will always be a delay in finding him when required to bring out a particular horse without previous orders. The introduction of guns of different calibre into a work, means special corrections in ranging each nature, and so should be avoided if possible.

As regards the armament:—The position of the gun should be such that its projectiles can most easily penetrate, and its fire generally be most injurious to the objective against which it is intended to act. As previously noted, the modern warship is built to encounter ships whose guns have no great command, consequently all their heavy

armour is at the sides and round the primary armament, and is capable of resisting the direct impact of projectiles, except those having great momentum. We must therefore make our warfare in a way to which these ships are unaccustomed, or we lose the great advantage which the choice of sites for our batteries confers on us.

No ship afloat can resist a plunging fire on the unarmoured decks, while the armoured deck is liable to penetration by high angle fire and plunging fire from guns using heavy projectiles. We may take it as an axiom therefore that the greater the command, the more effective the results of the fire; *i.e.*, that a comparatively light gun on a high site firing on to a deck, will do much more damage to a ship than a moderately heavy gun on a low site firing at the side of the same ship. The maxim "the flatter the trajectory, the lower the site," seems to me to play our opponent's game, except where a nearly point-blank range commands the approach, and the penetration at that range is greatly in favour of the projectile. For instance, a gun with a flat trajectory and great penetration is not wasted where it is intended to combine the functions of a shot gun and rifle, *e.g.*, to protect a mine-field or repel a torpedo raid, and at the same time to try conclusions with an ironclad. Unquestionably, if it has only to act as a rifle, the sooner it is transferred to as high a site as possible the better. Similarly with Q.F. guns, if the channel which they command is so narrow that torpedo-boats must pass within point-blank range, the lower the site the better, as the guns thus get the full advantage of their flat trajectory, and they are powerful enough to penetrate if their shell strikes the sides, but if the channel admits of the passage of an ironclad, their low site prevents their effective use against the superstructure on which alone they can make any impression; consequently an ideally protected passage would be provided in addition to the Q.F.'s on the low site with a battery of Q.F. guns with a high command. Just as in a battle between two armies, the fire of the artillery forces the opponents to deploy into fighting formation and commence the engagement at the furtherest possible range; so should the high angle fire of the fortress force the opposing fleet to disclose their plan of operations at the earliest possible moment, and so give time to the defenders to make arrangements to meet it. The possibilities of hits at 10,000 yards are well within the powers of the directing P.F. But should the fleet approach in cruising formation, it might perhaps be better policy to wait until the ships were closer in, so as to increase the probability of one or more being temporarily disabled while assuming their fighting formation and so causing a slight check, of which advantage would be taken by the defence to pour in a heavy fire.

Let us now turn to the range-finding arrangements. Considering the P.F. first:—When a gun can be laid over the sights, the general rule is for the P.F. to be used as a range-finder only, the direction being given by the gun layer; but when this is not practicable from any cause, the gun is laid and fired by "P.F. predicting." But owing to smoke from adjacent guns and other contingencies, it is obvious that a gun cannot always be laid over the sights, and this will inevitably be the case in the final stages of an attack pushed home, when every gun

will be fired as rapidly as possible, at the most visible assailant, except those which are directed by a P.F. and where the P.F. operator can see over or through the smoke, when they would be fired by "P.F. predicting." In the chaos of such an attack, the number of guns that can still be directed and fired in this way will have an enormous influence in deciding the fortunes of the day, as by so doing, the loss of *personnel* at this stage will be appreciably diminished. At this period everything will depend on the nerve and coolness of the operator in his cell. He should be shielded therefore from any disturbing influence, and every resource of skill and cunning should be utilised in locating the P.F. The first consideration being where it can best exert its influence for the longest possible period during the fight, and the next how it can be best concealed from the enemy's view; to build a little house for it on the flank of a battery, thereby making a conspicuous target of it, when near at hand there is a top story-room in a house of advantageous frontage that could be hired or bought for the purpose, is against common sense. If the little house exists, it should be left as a decoy, but I should certainly recommend the removal of the instrument to the top room aforesaid. In some cases, it must be in the work itself, if it is to be used at all. There it is naturally out of place, and in its lowest sphere of usefulness, but if there is absolutely no other position for it, then it must be concealed by every structural expedient.

Let us now take the case of the D.R.F., the elder brother of the P.F. Owing to the method in which it is worked, it must be situated in or close to the work whose guns it ranges. It must have a clear view of the water area these guns command, consequently the instrument and operators are exposed to fire, the amount of the exposure depending on the visibility of the work and instrument. If the position of the D.R.F. can be ascertained by the attackers, it is obviously to their advantage to render it unworkable as soon as possible. If they see a cluster of heads or an unusual projection on the skyline of the work, it will be quite worth their while to devote the fire of a portion of their Q.F. guns and Maxims to it. Thus we see that to obtain the greatest effect out of either of these instruments, it is absolutely necessary that they and their operators should be well concealed from the enemy's view, which at present is unattainable by the D.R.F., and consequently it would fail in its purpose as a ranging instrument at the most critical stage.

The same principle of invisibility should influence the site and construction of command posts to enable them to be tenable as long as possible.

As regards communications, the centre whence telephonic messages radiate should not be apparent, neither should the receiving ends of the radii advertise themselves in any way. Flag signalling in any exposed situation will only draw fire. Where facilities exist, failing telephonic communication, cyclist orderlies could be very advantageously employed.[1] I am not aware that the pneumatic tube system for

[1] Suggested by another officer.

despatching messages, similar to that largely used by the Telegraph Department in London has been tried, but it seems to me that it is worth trial; the air can be kept under high pressure in cylinders, so that the centre would not be encumbered by machinery for supplying the compressed air, and the advantage of delivering a written order over that of a verbal one spoken through a telephone, while guns are being fired and shells bursting in the vicinity, is incalculable.

To my mind, an up-to-date fortress with works, etc. laid out on the principles, which I have endeavoured to describe, has nothing to dread from an artillery point of view from the fire of a fleet; the only thought that need trouble the defenders would be, that the ships would not approach close enough to allow their guns to penetrate the "vitals"; but this is an almost groundless fear, for they must come in close if they mean business.

A fortress can be brought nearer to the requirements of modern times by making works to fit the guns, than by making guns to fit old and obsolete batteries. Now what will be the "battle formation" of ships attacking a fortress? Will they move, or anchor? We may safely assume that until they have overpowered the fire of the defence, they will take advantage of their mobility, and will move at such a speed as will permit of their making good practice and prevent them from becoming too easy targets for the opposing guns. They must then, if they move, have room in which to move about; consequently the number of ships actually engaged at any given range will depend on the sea room at that range. They will endeavour to get the greatest possible effect out of their armament and be careful to keep up a continuous fire without masking each other's guns. Therefore, the formation, when the real fighting begins, must be in a single line. Each ship will then conform to the movements of the one ahead. The whole fleet will sweep across the front of the portion of the fortress attacked, and when the leader can no longer effectively fire, each ship will turn round and the procession will recommence, with the former sternmost ship now acting as leader. A slight variation from this would be effected if each ship followed the exact course of the preceding one, and the leader retained her position as such, describing a circle ellipse, or figure of eight. It would not be so satisfactory a manœuvre as the first, because the rearmost ships will mask the fire of the leaders, or *vice versa*, at some point of their course; while by the other plan, the ships could keep up their fire, even when turning round.

We may also assume that they will preserve the same formation all through the action, as a good deal of signalling and manœuvring is necessary to change it, which is not likely to be attempted under a heavy fire.

The range at which these manœuvres will take place, will depend on the plans of the Admiral of the Fleet and on his instructions. He might like to run in close and have 15 minutes of it, or he might commence at long range and work in close, firing all the time. The attack further might be in one long line or broken up into sections; but once under fire of the fortress, and replying thereto, the ships

must move in one of these two ways, or after a similar fashion.

From the fortress point of view, we should have a succession of ships passing through the arcs of fire of the different works and groups. In that case as a general instruction we should open fire on the leader and follow her right through the arc; then pick up the next one entering the arc and follow her through, and so on to the last ship, keeping each one under fire as long as she remains in the arc of the group and is not masked by the following ships. This would happen when they were circling in the arc of fire of guns of low command. Should any particular ship become disabled the fire commander will specially order such guns as he may consider best for the work, to turn their fire on to her and complete her discomfiture.

Thus we see that all through the fight up to "close ranges," the defenders, owing to the tactics of the enemy, will be constantly chasing one objective after another, through their arcs of fire. Consequently the fewer the orders as to choice of objective issued by the F.C. or section C.R.A. during the action, the better. A change of objective means a temporary cessation of fire, while identifying the new objective, so although such a change is occasionally imperative, yet as long as the ships he wishes to be attacked are receiving all the attention that the Fire Commander desires, he will do well, after the engagement has commenced to allow the Battery Commanders to carry on against them as far as possible on lines fixed beforehand. Fixed lines, but not rigid ones. Any divergence should be regarded as a possible factor in the problem, and its effect only weighed and noted by the Fire Commander. Whether this divergence is due to imbecility or genius on the part of his subordinate ought to be well known to the former, and his action in the matter will depend on his knowledge of the offender's idiosyncrasy. A well-timed, happily resulting fire might change the fortunes of the day, and it would be quite wrong for any subordinate, quick enough to appreciate an opportunity, not to take full advantage of it; although the necessary orders had not reached him. The various links in the chain of command should be taught to consult their brain pans, and not the telephone.

In answer to the question, will the ships anchor? I say, No! except at close range, and then only if, owing to their heavy armour they consider they are protected from the fire of the fortress or there be not sufficient sea-room at that range to admit of the manœuvres of the necessary number of ships it is considered desirable to bring into action there.

As regards the identification of ships. It will be obvious that this will only be of importance in a "broadside" fight—(if I may use the term)—*i.e.*, when the attackers are not exposed to plunging fire from guns on high sites, it will be unimportant when they are exposed to a "deck" attack *i.e.*, when the *personnel* and unarmoured structures are under a plunging fire.

The following points then appear to be requisite to enable a sea fortress to resist the "secondary" attack of an opposing fleet:—

(1.) Invisibility of armament, range-finding and other installations.

(2.) High angle and plunging fire from ordnance with high command.

(3.) The employment of the P.F. at "close" range using "P.F. predicting."

(4.) Constant rehearsals of all possible forms of attacks.

Up till now we have dealt with the considerations of the attack on, and defence of, a Coast Fortress, from a purely artillery point of view as affected by the guns with which the fortress is provided, but before dealing with the aspects of the "primary" attack we must consider the manner in which torpedo-boats added to the defensive resources of the fortress influence the problem.

As I have said before, the attack of a fleet on a Coast Fortress will not be pushed home unless either the weakness of the defence invites it or when the fleet is fulfilling the *rôle* of Field Artillery in a battle on land by preparing the way for the "primary" attack. But the question as to whether the fleet will or will not push to "close" range will be greatly affected by the presence or absence of torpedo-boats in the defended area of the fortress attacked.

This will be apparent from the following consideration of the aspects of a "primary" attack on a Coast Fortress.

The "primary" attack will consist of either an attack by torpedo-boats, or boat attacks.

The object of a torpedo-boat attack would be the destruction of ships lying under the protection of the guns of the fortress.

To secure effective results from the torpedoes it will be necessary for the torpedo-boats to approach close to the object of their attack.

To enable them to do this without their being destroyed by the fire of the fortress, and of the fleet attacked, the attackers must either engage the guns of the fortress and fleet and push the attack home, when under cover of a heavy fire and smoke the torpedo-boats will dart in and endeavour to sink the ships at any cost to themselves; or under cover of darkness, or thick weather, the torpedo-boats will endeavour to elude the vigilance of their opponents and quietly steal in to effective torpedo range. Having effected their purpose they will trust to the confusion of a successful attack to make good their escape.

As regards the first form of attack it will be obvious that if the attacking fleet advance sufficiently near to enable their torpedo-boats to act effectively, they are themselves exposed to a counter attack from the defenders' torpedo-boats, which is just as likely to be effective.

Further, the time of action of the attacking fleet is limited by the fact that the effective range (to use an artillery expression) of a first-class torpedo-boat is about 100 miles from its base of operations, consequently the attacking fleet in the hours of darkness must be at such a distance from the fortress as will ensure its own safety from torpedo attacks.

The attackers cannot therefore commence their operations until some considerable time after sunrise, and they must run out to sea

again with a sufficient margin of day-light to enable them to get out of striking distance of the defending torpedo-boats before darkness sets in.

If, during their operations then, any of their ships are disabled, in the event of an unsuccessful action, these must fall into the defender's hands, as they will perforce be left to shift for themselves, and are thus exposed to capture or destruction.

From this it will be seen that this form of attack on ships lying under the guns of a Coast Fortress provided with first-class and other torpedo-boats is difficult and dangerous. Where the lines of approach are few and restricted the risk is further increased, but where the attackers have to fight their way in through a narrow channel, defended by modern skill, and fight their way out again the risk becomes enormous.

The task of the defenders will be to use their utmost endeavours to defeat the "secondary" attack by delaying the advance of the attacking fleet, taking into consideration the importance of time to it, and inflicting the greatest possible damage to it during its advance, but once the "primary" attack has developed by the appearance of the attacking torpedo-boats within effective range, every other consideration must give way to the vital necessity of destroying them before they can arrive at striking distance of the ships they menace.

The most dangerous form of torpedo warfare and the most to be dreaded is when torpedo-boats advancing from a distant base, under cover of darkness and thick weather, steal in unperceived to effective torpedo range.

In this form of attack the chances are greatly in favour of the attackers, and the only real safeguard would be to so restrict the lines of approach as to force the torpedo-boats to pass through narrow openings in a specially constructed mole or breakwater behind which the protected ships are at anchor. The approaches to these openings should be brilliantly illuminated by electric light, while the openings should be protected by Q.F.'s and heavy guns firing case shot and closed by floating booms or chains drawn across them.

From this then it would appear that ships anchored under the guns of a Coast Fortress, which is provided with first-class and other torpedo-boats, are not exposed to the first form of torpedo attack by night. They are so exposed by day.

If no defending torpedo-boats exist they are exposed to this form of attack by day and night.

They are always exposed to the second form, unless effectually protected from it.

The other phase of a "primary" attack may be considered under two headings.

(1.) Boat attacks pure and simple.

(2.) Attacks on booms and mine-fields.

As regards (1.) These attacks may assume a variety of forms, amongst them we may instance :—

(*a*) An attempt to land a party undetected at one place to destroy

or capture while the attention of the defenders is diverted by an attack elsewhere.

(*b*) Boats landing parties at night with the object of "rushing" a place or work immediately on arrival or at dawn.

(*c*) Boats sent in to capture a place or to destroy *matériel* under cover of the fire of the attacking fleet.

The presence or absence of torpedo-boats as adjuncts to the defence will obviously influence this form of attack, as these considerations will affect it in a precisely similar manner. The features of the defence will be :—

To prevent a landing.

To prevent any further operations after the landing has been effected.

In addition to the supporting fire of the fleet, which will be continued as long as possible, the defenders will also have to undergo the field gun, Q.F., Maxim and rifle fire of the attacking boats.

But once a boat attack appears imminent, it must be treated as the main attack and every arrangement made to meet it.

Care, however, must be taken to distinguish between a real attack and a "feint," as the object of the attacker might be to cause the premature disclosure of the means of defence against this phase of the attack, with the attention of crippling it with his main fire.

Should a landing be effected, the operations are at once converted into land operations, and the defence must be continued by infantry fire, assisted by the movable armament acting as Field Artillery.

As regards (2.) Booms may be destroyed by shell fire, or by boats under cover of the fire of the attacking fleet.

Mine-fields may be similarly cleared by boats either by creeping or countermining.

The defenders must therefore keep the ships at a distance, and failing this, engage the boats and destroy them before they can do any damage.

In this second phase of the primary attack also the presence of torpedo-boats will prevent any night operations and it will further materially influence their scope and character by day.

ARTILLERY AND MUSKETRY FIRE.

COMPARISON OF EFFECT PRODUCED IN A GIVEN TIME AND BY EQUAL WEIGHT OF AMMUNITION.

BY

CAPTAIN P. J. R. CRAMPTON, R.A.

The maximum effect which can be produced by any kind of projectile, be the conditions what they may, must eventually be governed by the amount of ammunition at hand, and as the weights which can be carried into the field, either on men's backs or in carriages, are limited, it is of interest to see what sort of ammunition is most effective at different ranges.

A considerable reduction in the weight of small-arm cartridges has recently been made. This lead will soon be followed by the artillery, as the introduction of cordite instead of black powder will reduce the weight of each round by nearly one-fifth.

However, there is no use trying to dip into the future; so any comparison must be made between the new Lee-Metford small-arm—and the present old pattern 12-pr.—ammunition propelled by black powder.

Every change in armament is naturally followed by assertions that the tactics of the future must be revolutionised.

Small-arm bullets are now said to be capable of killing at ranges of 2,500 yards and over: at artillery ranges in fact, and gunners are told that they must modify their tactics accordingly.

We are told that it will be impossible in future to bring guns into action at decisive ranges—at ranges of a mile and under—without such a sacrifice, in horses at anyrate, as will destroy all further usefulness as a mobile arm; that guns on the move at similar ranges will be exposed to an equal risk, even further; that musketry is now capable of breaking down the *morale* of infantry in a defensive position and of preparing and covering an infantry attack.

That the Lee-Metford and similar bullets are capable of killing even

beyond 2500 yards there can be no doubt: but to kill you must first hit, and hitting is a very different matter; but still the small-bore magazine rifle of the present day is a very superior weapon to those which were employed in the great wars of '70 and '71, and the tactical questions involved deserve and receive most serious attention.

In the recent manœuvres in France the extreme ranges at which artillery engaged were much commented on, and were attributed to a change in tactics following the introduction of the new pattern rifles. Generally the tactics were somewhat unfavourably criticised.

Criticism however is best left to those to whom experience gives a right to judge, and in this paper I merely propose to give the results of some practice under peace conditions, and to draw any conclusions from them which they appear to deserve, leaving the reader to apply any devisor he pleases to the average results under favourable peace conditions, so as to reduce them to what might be expected on active service.

There is no doubt that under favourable conditions the long range fire of the old pattern rifle has now and then been very effective in action, whilst that of the new rifle under peace conditions compares not unfavourably with the effect of an equal weight of ammunition fired from guns, up to a range of a mile or thereabouts—until the eternal factors of time and space are taken into account—when the advantage is seen to be with the gun and will probably remain so for a long time to come.

By time is meant the length of time, be it hours or minutes, which is necessary to attain a given effect, say, the destruction of ten per cent. of the target fired at; by space, the frontage on which the firing party, whether artillery or infantry, stand, as the extent of frontage in the firing line of battle, occupied by troops engaged in preparing the attack or covering it, must be of great importance when large bodies meet.

Infantry field firing was carried out at Glenbeigh this year in connection with the annual gun practice there under the command of Colonel Holley, the object was to see what effect might be expected from musketry fire at long ranges under favourable peace conditions, and more especially at artillery targets.

There was no idea of comparison between the two arms, though on one day artillery and infantry fired at the same targets in succession; this was due to the short time troops remained in camp and so both arms necessary practised every day, and as on one occasion the targets were suitable both arms made use of them.

In the table of statistics attached, details will be found of each series fired. Series 1 to 8 inclusive were fired at service targets, 1 and 3 at guns with detachments in action exposed to frontal and enfilade fire, 2 and 4 at infantry targets placed in position by officers of a course then in camp. The firing line and supports were represented by kneeling and standing dummies placed on the crest and reverse slope of a ridge of sand hills; the reserves were represented by screens placed about 150 yards in rear and defiladed from view.

Series 5 to 8 were fired at purely artillery targets representing a

battery of 4 guns with horses and detachments complete under service conditions, while three other series were of an experimental nature and intended to show the power of the Lee-Metford rifle. The effect of these latter are omitted from the calculations made for comparison of effect with that of guns, since not having been fired at service targets they offered no data.

12,000 rounds of Lee-Metford (cordite) ammunition were fired: of these 10,000 rounds were used in series 1 to 8. This amount is of course not nearly sufficient to give any reliable basis of calculation, but the calculations are interesting though only of a tentative nature, and if approved of may give grounds for hoping for a larger amount of ammunition on another occasion.

For comparison with the effect of musketry we take the mean of all rounds fired by guns this year at Glenbeigh; and it should be remembered that most of these rounds were ranging rounds and that a large proportion of the shell fired were common shell, the effect of which is practically nil; of course, when shrapnel were used for ranging some effect may be put down to the ranging rounds, of these the average number in each series was 13, of time shrapnel in ordinary fire only 8; so that it will be seen, that as soon as fire had become effective, it was stopped owing to want of ammunition.

The average duration of ordinary fire was in fact less than two minutes.

The units compared are a battery of 6 guns and a company of 100 men, as these under normal circumstances take up practically the same amount of space in the firing line, though the battery could work equally well at a reduced interval and the frontage taken up by the company might also be reduced though not so conveniently.

The target in all cases was of about equal frontage to that of a battery or company.

The method of calculation employed is as follows: Taking the data in the table of statistics as a basis, there is no difficulty in working out the per centage of target destroyed for any given weight of ammunition in the different series. For instance, in the 1st series, if 900 rounds weighing about half a hundred weight destroy nearly 4 per cent. of the target we might neglect the theory of probability and assume that an expenditure of twice or three times as much ammunition ought to ensure the destruction of 8 or 12 per cent. of the target without running any very great risk of error, as the number of dummies hit is very small—if however in series 12 we made the same assumption we ought to expect the destruction of 88 or 133 per cent. of the target in each case, which is manifestly absurd.

Similarly there is no great objection to deducing the effect to be expected from 100 rifles firing for one minute from that of 180, or even of 90 rifles firing for four or five minutes or more, but it would be unsafe to trust such a deduction as applying to 1000 rifles—or for a considerable length of time.

The weight of each round of Lee-Metford ammunition is 1 oz.

Each 12-pr. shrapnel weighs 12 lbs. 8 ozs., and the cartridge 4 lbs., total 16·5 lbs. When cordite ammunition is introduced the total

weight will be only 13 lbs. 8 ozs., and the results arrived at are still more in favour of the gun.

Thus the lowest unit of artillery ammunition is one round weighing 16·5 lbs., and this forms a suitable weight for a basis of comparison with musketry fire—264 rounds of Lee-Metford small-arm ammunition also weigh 16·5 lbs. All deductions of effect for weight of ammunition fired will be referred to this basis.

The table of statistics gives the number of dummies hit per round in each series, and to obtain the number of hits per 16·5 lbs. it is only necessary to multiply by 264.

The table of artillery statistics gives the average of dummies hit per shell, and so a definite comparison of effect obtained for each 16·5 lbs. of ammunition carried on the soldier or in the limber boxes is possible.

(1.) To calculate weight of ammunition expended per minute.

At Glenbeigh the mean rate of ordinary musketry fire (section volleys) was 1·8 rounds per man per minute; of magazine volleys, 4·75 rounds or practically three times as much, though sometimes a rate of nearly five times that of ordinary fire was obtained.

The average rate of artillery ordinary fire may be taken at 4 rounds per minute for extended periods. Magazine fire has run as high as 13·5 rounds per minute, but let us say 12 rounds or again three times the rate of ordinary fire; from these data it appears that a company of 100 men fires 10 lbs. 10 ozs. of ammunition in ordinary, and 32 lbs. a minute in magazine fire, while a battery fires 66 lbs. in ordinary and 198 lbs. a minute in magazine fire.

(2.) Per centage of target destroyed per 16·5 lbs. of ammunition without respect of time, *personnel* (dummies) only.

In each of the series the number of dummies fired at is stated, also the number of dummies hit. As an example:—If the mean of series 1 to 4 is taken, it will be seen that the mean per centages of target destroyed in each series is 4·5; that the average number of rounds fired was 901, and that the mean range was 2100 yds., so that, roughly, we may expect to get one dummy hit for every 200 rounds fired, and working out a small sum in proportion we may expect 1·32 per cent. of the *personnel* of a target of about 80 yds. front to be destroyed for every 264 rounds of S.A.A. (equal in weight to one round of gun ammunition) fired at a range of 2100 yds. Similarly from the artillery table at a range of 2097 yds. we may expect that out of a target consisting of 43 dummies 1·13 will be hit by every shell, brought to a per centage this gives 2·63 per cent. which is about double the effect to be got from small-arm fire under similar conditions.

(3.) Now we come to the question of the time necessary to produce a given effect, say, to destroy 10 per cent. of a target.

Using ordinary fire a company 100 strong fired an average of 180 rounds a minute, with magazine fire 475 rounds, and so under the conditions of target which we are considering we may expect to get a per centage effect of ·9 and 2·38 respectively, and in the first case it will take 11 minutes and in the second 4·2 minutes to reach an effect of 10 per cent.

A battery fires 4 rounds a minute, but this could be increased to 6 for special occasions, and if magazine fire is used, up to 12 a minute, but considering ordinary fire only if we multiply 4 by 2·63 the per centage effect to be expected from each shell, we might expect to destroy 10 per cent of the target in a little less than a minute at 2100 yards range. Unfortunately figures are often very misleading and it takes a battery, as a rule, about 6 minutes to establish effective ordinary fire after they come into action at medium ranges, at closer ranges it would not of course take nearly so long to range the battery, but even so, the results of peace practice, more especially when horses are taken into consideration, would lead one to think that a battery would go through a very unhealthy few minutes until effective fire was established if they came into action at a range under 1500 yds. against infantry who knew the range and who were firing under favourable peace conditions. These however are the doubtful factors, the conditions would certainly not be those of peace, and it would be very unlucky if the infantry knew the range; moreover they cannot range as gunners can by observation, their observation can only be negative by watching if their fire knocks men over or not, as they cannot tell if the bullets fall over or short of the target.

These observations only apply to cases where a battery might be caught "on the hop" or when coming into action, but in all other cases the comparative effects may be considered to hold for peace conditions after both battery and company have ranged their target.

(4.) Fourthly we come to the space occupied in the firing line by the two arms.

The mean space occupied by 100 men on the firing line at Glenbeigh was 90 yards; the frontage of a 6 gun battery is generally about 80 yds., but for all practical purposes it may be taken as the same as that of the company. To inflict a loss of 10 per cent. in a given space of time by ordinary fire, such as in preparing an attack, if it is desired to do so by musketry instead of artillery fire, more than 10 times the space must be taken up. Magazine volleys could of course be employed, but not for any great length of time. To produce the same effect in the same time as two brigade divisions occupying a space of about 600 yds., infantry would have to be extended over nearly four miles, which it will be allowed is a *reductio ad absordum*, as no concentration of fire would be possible from such a long line.

To epitomize the foregoing, the following calculation is prepared:—

Per centage of target destroyed by a battery or company firing at a target of equal frontage for one minute. This is in fact to reduce the calculation in (2)—which only dealt with the number and weight of rounds fired—to what 100 men can do in one minute.

The calculation of each series are given in the table of statistics, and the mean per centage works out at ·57 in the four first series fired at a mean range of 2100 and at 1·82 in the eight series fired at 1675 yds.

In artillery firing four rounds a minute the per centage of target destroyed per minute works out 10·5.

The foregoing examples will be sufficient to show the method of calculation employed—it is of a rough and ready kind, and the theory

of probability is entirely neglected as has already been explained.

We can now proceed to consider the different series as they were fired.

Series 1 to 4 were fired at ranges from 1800 to 2400 yds.—the ranges were previously carefully measured by range takers and were also verified by guns. This, the first day's shooting, was probably less effective than it would have been later on. Infantry officers present expressed great disappointment at what they considered meagre results, but considering the long range and difficult targets, more especially the infantry target, the results are not so bad when compared with the mean results of artillery firing an equal weight of ammunition at very similar targets.

The dummies were placed on a range of low sand hills so that ricochets could hardly be expected. Rain had fallen in the morning and the sand was damp; whether this was the cause or not, it was impossible to observe the strike of volleys or of individual bullets with even the most powerful glasses. The mean per centage of target (4 gun detachment in action) destroyed per 16·5 lbs. of ammunition fired in series 1 and 3 was 1·62 : of infantry target (standing and kneeling dummies and screens), in series 2 and 4—·77 per cent.—the targets were practically of equal frontage to the firing line—ranges 1850 and 2300 yds. respectively.

The mean results of all the batteries practising at Glenbeigh this year at all sorts of targets at a similar mean range of 2100 yds. was 2·63 for each round fired, weighing 16·5 lbs. as already stated, but it should be remembered that ranging rounds are included, and being mostly common shell, they very materially reduce the effect produced by artillery on the practice ground.

It is unfortunate that data similar to those taken at artillery practice are not available in the case of musketry. Deductions made from the result of a few days field firing cannot be depended on as can average results taken under all sorts of conditions of weather and target. At Glenbeigh the first four were the only series fired at an infantry target, and the rounds available were very few for the purpose. For calculation of effect on *personnel* we can however include the results obtained on the dummy portion of the artillery targets fired at in series 5 to 8; when, taking the mean of the whole 8 series, we get the range as 1675 yds. and dummies hit per round ·0024—from this we can deduce a per centage of 1·81 per cent. destroyed of the target fired at for an expenditure of 16·5 lbs. of ammunition, which is not so far behind the artillery average, though the range in the case of the latter is considerably more, namely 2097 yds.

From the results given in the table it is evident that the effect of musketry fire increases rapidly as the range decreases from about 1500 yds. Results of field firing recently carried out on the continent, at ranges of 660 yds. and under, are available through the kindness of an officer who was present, and are given in the table of statistics numbered series 9 to 12. Of these series 9 and 10 were fired by dismounted cavalry under conditions somewhat similar to those obtaining at Glenbeigh, though not nearly so favourable to the rifle except in

the matter of range: the great increase in effect for equal weights of ammunition is very noticeable.

There are no data available of artillery fire at similar ranges for comparison, but it is probable that the effect of musketry fire increases more rapidly than that of artillery with a decrease of range, not only in effect for equal weights of ammunition, but also in effect produced in a given time by firing parties of either arm occupying an equal frontage. The column in the table of statistics, "per centage of target destroyed per 6 guns or 100 rifles firing for one minute," tends to show that at a range of 2100 yds. artillery fire is about 11 times as intense as that of infantry. At 1375 yds. musketry fire is more than 3 times as effective, while at 660 yds. it is more than 20 times as effective as at 2100 yds.

It is reassuring to the gunner to find from the same column that artillery fire at 2097 yds. mean range appears to be as effective as that of musketry at 660 yds., so that the critical range, when musketry is equal to artillery fire, ought to lie somewhere between 660 yds. and the muzzles of the guns if it exists at all.

Up to the present guns have been able to defend their own fronts, at least against an attack by infantry, and there is certainly nothing to make one suppose that they will be unable to do it in future. The per centage column in series 11 and 12, which were fired by infantry advancing in attack formation, shows how movement reduces their fire effect. Guns should have nothing to fear from a mere frontal attack of infantry.

But the improvement in small-arms affects them more seriously when guns are supposed to advance to close range to support an attack, or for other reasons, or if they were caught on the move in a close formation.

Series 5, 6, 7 and 8 were fired to try and throw some light on this subject.

The targets consisted of 4 guns with detachments and horses complete. The men represented by dummies and the horses by screens. Three screens represented 6 horses; each screen being considered equivalent to a pair of horses. One hit on one screen was counted 1 horse disabled, two or more hits being counted as 2 horses disabled.

These screens were pivoted on the centre and arranged so that they could be exposed vertically or horizontally by means of hauling ropes worked from a splinter-proof.

When exposed vertically the screen was in full view of the firing party, when horizontally or edgeways it was practically invisible from the range fired at—at any rate it offered no target.

The screens were placed between the guns so that the horses were represented as in the most exposed position which they could find themselves in when unlimbering on coming into action or when limbering up to retire.

The arrangements were made to allow of practice taking place under the most favourable possible conditions of peace practice. The ranges were carefully found previously. The firing parties were placed in position and the guns and dummies were pointed out

previous to the horse screens being exposed.

It was assumed that a battery would take a minute after it appeared in the position before the guns could be unlimbered and the horses cleared away to a position of comparative safety or, at any rate, taken clear of the guns.

The first portion of each series consisted in the horse screens being switched into view and remaining so for one minute, when they were switched off again by the range party.

Cease firing then sounded and the hits then counted.

In the second portion of the series fire was continued at the *personnel* of the battery and the guns, the horses being kept concealed for five minutes and then again exposed for one minute to represent the battery limbering up to retire. This second exposure was made without any cessation of fire. Owing to insufficient ammunition it was not possible to keep up fire at the *personnel* of the battery for the contemplated five minutes. As will be seen by the table this period varied from two minutes thirty seconds to five minutes. The usual procedure was as follows:— On the horse screens appearing fire was kept up as rapidly as possible, on one occasion magazine volleys were fired. Fire in the second period was more deliberate, but became rapid again when the screens appeared for the second time.

The great effect obtained against the horse portion of the target is very apparent, the average of 6 series of one minute, each gives 32 per cent. of horses destroyed per 100 rifles per minute; the per centage varying from the highest at 62 per cent. to 4·7 per cent. at the lowest. The per centage of men hit is curiously small, being only 3·1 per cent., and varying from 6·2 to zero, the ranges were at 1000, 1200 and 1500 yds. The greatest effect on both horses and men was obtained at the 1200 yds. range. Firing began at 1000 yds., and perhaps the men, through not being accustomed to the work, shot better as time went on, but it is suggestive that the best practice in every way was made when most room was allowed to the individual soldier and when the rate of fire was comparatively rapid.

In series 7, just before the horse screens were turned on for the second time, it was found that the ammunition of the firing line was almost exhausted, and fresh men were hurriedly brought up to replace them. The effect of the factor of hurry is well shown in the result, which was only one-eighth of that obtained in the previous series at the same range.

Series 8 was fired at a somewhat similar target representing a battery of four guns in column of route. The conditions were made as favourable as possible as before. Range 1300 yds. The dummies on this occasion were mounted on the carriages as they would be in a field battery, and so, being more exposed, suffered more than in previous series. The per centage of horses destroyed per minute works out to 8 per cent. per minute, but as 20 out of 24 horses were hit by some 60 bullets, the method of calculation appears to have made the per centage unduly small. The occasional fallacies of figures have already been touched upon.

Fire in this series and in all others, except the first portion of series 7,

was by section volleys, in the excepted case it was by magazine volleys, and the latter method was also employed in some of the experimental series which are not noted in the table attached.

The results tended to show that not only is a greater effect produced, as might indeed be expected from the greater number of rounds fired, but that magazine volleys are more effective round for round expended as compared with section volleys; it may be that the longer dwelling on the "present," which takes place in ordinary fire, tends to shake the aim.

From the four series, 5 to 8, in which both men and horses were fired at, we may deduce the following averages, the target being practically the same on each occasion.

MEAN RANGE 1250 YARDS.

Per centage of target destroyed per 100 rifles firing for one minute.	... ...	Men, 3·1.
	... ...	Horses, 32.

If we could assume that this effect would be the same under service conditions, the outlook would be a very unpleasant one for the horses of a battery coming under infantry fire. But if the effect of only one of the factors of service conditions—hurry—was to reduce the per centage from 37 to 4·7, a battery commander may fairly hope to be able to bring his battery into action under the fire of infantry occupying a frontage equal to his own at 1000 yds., or even less, without necessarily sacrificing his mobility.

As to movements to a flank under fire, the effect in series 8 would no doubt have been very much greater if magazine volleys had been fired instead of section volleys; and if a battery were caught in column of route on a narrow road within 1300 yds. of infantry who knew the range and were expecting them, it is very probable that that battery would lose the greater part of its horses.

Gunners, however, are well aware of the danger of such movements, and where they are necessary open formations and a rapid pace are enjoined by the drill-book.

The relative value of artillery, as compared with musketry fire, is certainly not less now than it was in 1870; though guns have not gained as much in range as have small-arms, they have made up for it by increased efficiency in other directions.

Though the results of the data given tend to show that guns will not be able in future to move freely and come into action within half a mile or so of infantry with comparative immunity, as was the case heretofore, it must be remembered that if cover exists they can now bring fire to bear without necessarily showing themselves at all from positions in which they are practically safe from musketry fire.

In the matter of adjuncts for indirect laying one must admit regretfully that we are not keeping level with continental Powers with whom the clinometer is fast superseding the tangent scale. With us a satisfactory field clinometer has still to be found—when supplied, this important matter will no doubt receive the increased attention which it deserves.

Statistics of Field Firing arranged for comparison with results of Artillery Service Practice both for effect obtained in a given time and from equal weights of Ammunition.

Date and place	Musketry. Glenbeigh, June and July 1895.									Musketry. Continental, 1895.				Artillery. Glenbeigh, 1895.
Number of series fired	1	2	3	4	5	6	7	8	Average	9	10	11	12	Average of 8 Batteries,
Number of rifles firing	90	90	93	93	180	94	95 | 180	180	...	82	82	1090	1090	... ...
Frontage occupied in yards	100	100	70	90	120	100	90 | 100	160	...	...	...	...	...	85^{16}
Time taken	7′ 50″	9′ 50″	7′ 30″	8′ 20″	1′ 0″ | 3′ 30″	1′ 0″ | 3′ 50″	0′ 57″ | 6′ 0″	5′ 55″	...	6′	about 10′	45′	15′	Ranging 6′ 15″, ordinary 2′ 0″
Nature of target	Arty[1]	Infy[2]	Arty[3]	Infy[2]	1st period 4-gun battery coming into action, horses exposed 1 minute. 2 period in action & limbering up.			Arty[4]	...	Infy[10]	Infy[11]	Infy[11]	Infy[12]	... ...
Number of rounds fired	900	899	930	876	400 | 1390[5]	282 | 1020[5]	429 | 1672[5]	1258	...	615	866	16300	6800	Ranging 13·26. Time shrapnel 8·25
Number of volleys fired	40	40	40	40	40	75	35 | 100	56	...	...	...	...	...	... ...
Number of rounds fired per man per minute	1·27	1·09	1·33	1·2	2·14	2·9	4·75[6] | 1·5	1·18	ord 1·8 Mag. 4·75	1·25	1·06	·33 farth'st	·42 farth'st	... ...
Range in yards	1850	2400	1850	2300	1000	1200	1500	1300	1675	575	600	660	350	2097
Number of dummies fired at	26	100	26	100	18	18	18	20	...	40	27	1205	583	43
Number of horses fired at	...	...	...	...	24	24	24	24	...	...	...	...	...	... ...
Number of hits	1	0	2	5	26 | 23	24 | 22	18 | 3	68	...	67	36	1414	1599	84·65
Number of men hit	1	0	2	5	0 | 1	1 | 4	1 | 1	8	...	21	16	489	304	23·73
Number of horses hit	...	...	...	...	18 | 8	12 | 14	8 | 2	20	...	...	...	...	...	... ...
Hits per round	·0011	·0000	·0021	·0057	·0650[7]	·0165[8]	·0850[7] ·0215[8]	·0420[7] ·0018[9]	·0540[7]	...	·1090	·0415	·0867	·2351	4^{17}
Men hit per round	·0011	·0000	·0021	·0057	·0000	·0007	·0035 ·0039	·0023 ·0006	·0064	·0024	·0341	·0184	·03	·047	$1·13^{17}$
Horses hit per round	...	...	...	...	·0650	·0200	·0425 ·0496	·0186 ·0012	·0160	·0304	...	...	...	...	... ...
Per centage of target per 6 guns or 100 rifles firing for 1 minute — Men	·53	·00	1·11	·65	·66	5·9	1·65	4·2	1·82	$10·75^{13}$	$7·22^{13}$	$·083^{14}$	$·319^{15}$	$10·5^{18}$
Per centage of target per 100 rifles firing for 1 minute — Horses	...	...	...	...	41 | 19	53 | 62	37 | 4·7	8	32	...	...	...	...	... ...
Per centage of target per 16·5 lbs. ammunition — Men	·88	·00	2·13	1·5	·82	5·67	1·4	9·22	2·7	$22·5^{19}$	$18·2^{19}$	$·66^{19}$	$2·02^{19}$	2·63

Notes.—[1] 4-gun detachments in action. [2] 100 dummies in a defensive position. [3] 4-gun detachments in action enfiladed. [4] 4-guns detachments and horses column of route. [5] Take expenditure in last minute same as in first. [6] Magazine fire. [7] Horses exposed whole of the time. [8] Horses exposed for 1 minute only. [9] Horses exposed for 1 minute and firing line brought up hurriedly. [10] Standing dummies. [11] Dummies kneeling and lying down. [12] Dummies to represent infantry in column. [13] These series fired by dismounted cavalry scouting under nearest approach to service conditions, range not known. [14] Fired by infantry advancing to attack troops in position under nearest approach to service conditions, ground much broken and covered with bushes, range not known. [15] Fired by infantry after making attack and occupying position, target to represent defenders retiring. [16] 6-gun batteries. [17] Including ranging rounds. [18] Ordinary fire at 4 rounds a minute. [19] Taking cartridges at 1 ounce each.

CONSIDERATIONS ON THE SUBJECT OF TRAJECTORIES.

BY

CAPTAIN F. J. S. CLEEVE, R.A.

THE following considerations suggested themselves in connection with the conditions appertaining to gun practice with 7-pr. 200 lbs. and 2.5-in. guns in the Himalayas in 1884 and 1888. Whilst feeling that I have regarded the subject from a purely speculative point of view, which I am unable to do justice to or support mathematically, I hope that I may have suggested a few points which may be of interest as a subject of discussion to others. My best thanks are due to Mr. Greenhill, M.A., F.R.S. for his kind advice and assistance in dealing with the subject.

(1.) Let *A* be the position of the gun capable of being fired at any angle in a vertical plane passing through it. The angles considered are angles of quadrant elevation and are numbered accordingly (*v.* Fig. 1), tangent elevation being disregarded. Muzzle velocity is assumed to be greater than terminal.

(2.) In firing vertically downwards, *i.e.* 90° depression, gravity has maximum accelerating effect and *terminal velocity will tend to attainment at maximum distance from A* (muzzle velocity being greater than terminal, remaining velocity though continually decreasing towards terminal will never attain the same).

(3.) As angle of depression decreases, horizontal component of velocity of projection will increase, but in decreasing ratio, and trajectory will become more and more curved owing to angle at which gravity acts. Vertical component of velocity of projection will decrease and vertical asymptote will be attained *and terminal velocity tend to attainment at a gradually decreasing range from gun.*

(4.) At a certain angle "*x*" velocity will decrease *and attain terminal velocity* at which it will remain infinitely, *i.e.* for this trajectory *there will be a line and not a point of minimum velocity.*

(5.) For every trajectory above this angle "*x*" velocity will decrease *to less than terminal* (for + 90° decreasing to 0) and increase towards terminal which will never be attained, thus *containing a point of minimum velocity.*

(6.) Above — 90° to "*x*," *i.e.* for all angles at which terminal velocity is not reached, the point of minimum velocity will be at infinite distance from *A*, but will, if such a thing be conceivable, be at a distance from *A* gradually decreasing from — 90° trajectory upwards.

(7.) At a certain *angle "y,"* which it is thought may be 0°, lateral component of velocity of projection is at maximum and *maximum lateral range, i.e.* distance from *BAB'* would be attained, *i.e.* vertical asymptote is attained at maximum distance from *BAB'*.

(8.) The curve *B'C* is assumed to represent the points at which vertical asymptotes of trajectories are attained from — 90° to "*y*."

(9.) As elevation increases from *y*, lateral component of velocity of projection will decrease, and in an increasing ratio, hence greatest lateral distance of the trajectory from *BAB'* before attaining vertical asymptote will decrease, *and each trajectory will cut every one (above y) below it in succession* and on attaining verticle asymptote *coincide with the asymptote of a trajectory below "y."*

(10.) For trajectories of elevation gravity has a retarding effect while projectile is travelling upwards and an accelerating effect when projectile commences to fall, hence minimum velocity above "*x*" will continue to decrease and, owing to angle at which gravity acts, trajectory in upward path of projectile will become gradually flatter until at + *90° it is absolutely flat, gravity has maximum retarding effect, range is at minimum, minimum velocity is nil,* and there is no horizontal component of velocity of projection.

(11.) *The curve CB* formed by the points at which each trajectory above "*y*" cuts that of the angle of elevation which is by a minimum below it, *is the curve of maximum range, i.e.* any point in that curve is at the maximum attainable distance from *A* in that direction, and there is *only one trajectory that will strike any point on line AB, curve BC, or vertical asymptote CD.*

(12.) Point of minimum velocity of + 90° trajectory being on curve *BC* at point *B it appears possible that points of minimum velocity of angles above "x" will be on that curve and increase from 0 to terminal along it.*

(13.) That *angle x will be synonymous with "y"* and that *line of terminal velocity referred to in para. (4) will be the asymptote CD forming part of the envelope.*

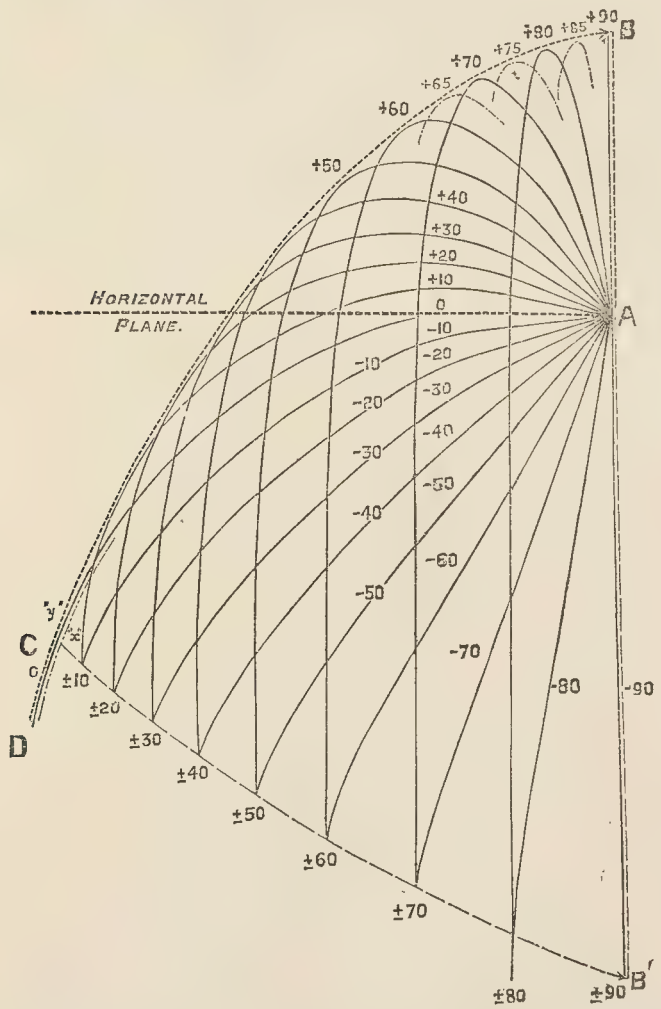
(14.) It also appears that within the line *BCD* (except along *AB*) *there are two trajectories and only two* that will strike any point in the same, these two trajectories being the two that intersect at that point.

(15.) It is thought that below CB' the trajectory of an angle of quadrant elevation will coincide with that of the corresponding, *i.e.*, the same angle of quadrant depression.

(16.) Of the two trajectories that will pass through any point, one will be a trajectory corresponding to an angle above "*y*," *i.e.*, presumably of quadrant elevation, the other to an angle between + and − 90°.

(17.) The nearer the point is to the boundary ABC the less the difference between the angles corresponding to the trajectories that will strike the point.

(18.) The farther from C and nearer AB' the greater the difference, which, along the trajectory CA, will increase from 0° to 90° and along CB' from 0° to 180°.



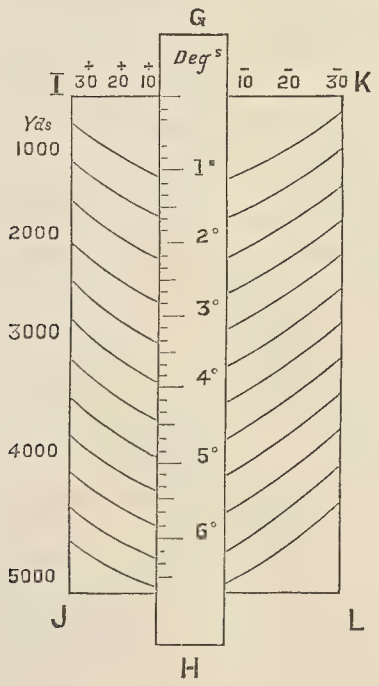
An experiment in which the conditions might be approximately realised, could be made by means of a small jet, or preferably two small

jets of water under uniform pressure and capable of being inclined at any desired angle.

For purposes of tangent elevation the lower of the two intersecting trajectories would be taken, and for any point, the angle of tangent elevation will be the difference between the angle of sight and angle of quadrant elevation or depression of the trajectory passing through that point. To trace changes in tangent elevation due to firing up or down hill for a given range, describe a semicircle at that range and ascertain and compare tangent elevation for any number of points in its circumference. If semicircles be described at various ranges, the line or curve of maximum tangent elevation corresponding to range, may be ascertained. Similarly a range table shewing tangent elevation can be constructed for any desired angle of sight. Also a range table can be constructed for a fixed height above sea-level, *i.e.*, for the different angles of sight corresponding to the various ranges. In this case the intersections of the trajectories with a horizontal line below *A* would be taken.

For ordinary cases of fire at angles of sight varying from the horizontal to an extent likely to be experienced in mountain warfare etc., the undermentioned contrivance enables the required correction to be readily ascertained.

A scale of degrees (according to scale) is engraved on the sliding



scale *GH*. Along *IJ* is engraved the number of yards corresponding thereto for the maximum desired angle of sight, say 30° elevation. From *IJ* to *KL* are drawn curves, at any desired distance, indicating the changes required for all angles between ± 30°, the intermediate

angles being marked along *IK*. The sliding scale is placed at the required angle, and the curve corresponding to range is followed to its intersection with the sliding scale, which gives the required elevation in degrees.

As a practical question, it is hoped that the above may afford a means of acquiring a general acquaintance with the effect of such conditions, which may be useful (partly to sportsmen) in firing down steep mountain sides. Also for firing at balloons, or machine-gun fire from the tops of ships. It appears to concern the relative value of howitzers and high velocity guns for mountain warfare, and might be a useful method of graduating sights for high site coast artillery mountings, in cases where the assumption of the rigidity of the trajectory might not be sufficiently accurate.

THE BATTLE OF AUSTERLITZ.

TACTICALLY CONSIDERED.

BY

LIEUT.-COLONEL J. C. DALTON, R.A.

(Lecture delivered to the Officers of the Garrison at Devonport, 16th December, 1895.)

Before proceeding to the purely tactical consideration of this battle it is advisable to glance rapidly at the events which led up to it.

Strategical position before the battle.

The Treaty of Amiens, March 28th, 1802, which had for the moment patched up the quarrel between England and France, that had been going on without intermission for nine years, was broken in 1803. Napoleon Bonaparte, then First Consul, irritated at his schemes being thwarted, seized Hanover and organized a magnificent army at Boulogne, destined for the invasion of England. The English nation was roused, and in an incredibly short time 300,000 Volunteers were organized and drilling for the defence of their homes. This fact, coupled with the irresistible power of the British navy, rendered all attempts at invasion futile, and Napoleon, who had been made Emperor in 1804, suddenly changed his plans, and, early in 1805, by a stroke of the pen, annexed the State of Genoa to France. This alarmed the European Powers, who saw no limit to his ambition. Russia and Austria at once declared war against him, and Prussia made preparations against a similar contingency.

Napoleon accepted the situation with confidence; he had never possessed a finer army, and by the middle of 1805 his entire force, which had been drawn up facing England, from Hanover on the right through Holland and Belgium to Brest, changed front to rear and advanced towards the Rhine and Danube. At the same time the French troops in Upper Italy under Massena concentrated in order to attack the Austrians in the Venetian country.

The Russian army under Kutusoff with the Emperor Alexander I., marched to the assistance of their allies, but before they could get up, the Austrians had been badly defeated in Bavaria by Napoleon, the larger part of Mack's force of 90,000 men having surrendered at Ulm. Only two corps escaped, one under the Archduke Ferdinand reaching Bohemia, and the other under Jellachich being intercepted and captured by Marshal Augereau near Feldkirch.

Napoleon, after this brilliant start, pushed on to Vienna, notwithstanding that he was threatened in front by Kutusoff with 50,000 Russians and 40,000 Austrians, and on his right by the forces commanded by Archdukes Charles and John, of whom the former was retiring on Vienna after being defeated by Massena. Kutusoff, however, hearing of the capitulation of Mack, retired across the Danube by the bridge of Krems, which he burnt after he had crossed, and after an unsuccessful encounter with a small French force under Mortier, the allies retired into Moravia, followed by Napoleon, who had entered Vienna 15th November, 1805.[1]

See Map I.

We may therefore sum up the state of affairs as follows:—KUTUSOFF left Krems with the 1st Russian Army on the 13th of November in order to effect a junction with the 2nd Army under BUXHOWDEN at Olmutz. He was making for the road to Znaim, threatened in front by MURAT and in rear by BERNADOTTE. By inducing MURAT to agree to an armistice, he succeeding in escaping, leaving his rear-guard under Prince BAGRATION with 8000 men to encounter the French with 40,000 near Hollabrunn. KUTUSOFF effected his junction on 19th at Wischau, having opened up communication with the retiring Austrians. BAGRATION nobly kept the French at bay during the whole of the 16th and 17th at the expense of half his force, and joined KUTUSOFF on 19th. Hollabrunn was burnt by the French, and Marbot, who was an eye-witness, relates that numbers of the Russian wounded were unable to escape and were burnt alive. Not a single house was left standing.

Allies retire to Olschau 21st Nov.

The allies retired on 21st November to Olschau. Strength about 75,000.

Napoleon at Brunn 20th Nov.

NAPOLEON halted at Brunn on November 20th and placed it in a state of defence. It had been foolishly abandoned by the allies and was an important position for NAPOLEON, as it secured him a line of retreat through Bohemia.

Movements of French troops.

NAPOLEON, now finding himself threatened on all sides, at once made the following dispositions:—

DAVOUST to Presburg, BERNADOTTE to Iglau to observe the Archduke FERDINAND, MARMONT to the road to Styria to observe the Archduke CHARLES, MORTIER to remain in Vienna, SOULT and LANNES, with the Guard and MURAT'S Cavalry, to Brunn.

Their positions on 25th Nov.

NAPOLEON now opened negotiations with the allies and thereby gained time to rest his troops, but continued his preparations, and on the 25th he reconnoitred the field of Austerlitz. He pretended not to wish to take the offensive, and was apparently waiting either for ARCHDUKE CHARLES or for the Prussians to move. He was in a central position and could concentrate his troops at short notice at any point. MURAT and SOULT were at Wischau and Austerlitz; BERNADOTTE and DAVOUST were to be ready to join head-quarters at a moment's notice.

From the 22nd to the 28th the contending armies remained within about seven miles of each other. The French were cantoned between

[1] For the sake of clearness, I propose to give the names of the commanders on each side in small capital letters.—J. C. D.

Wischau and Brunn and the allies were waiting at Olschau for the reserve under Grand Duke CONSTANTINE. The Russian Emperor had arrived, and his presence greatly encouraged the troops. The Austrian Emperor Francis was also present. The Reserve joined on 25th November.

Movements of allies.

The allied army now amounted to 90,000 men. Though close to the French, they took no trouble to reconnoitre the positions of the latter, and made an entirely wrong estimate of affairs. Their Chief of the Staff was WEIROTHER, to whom NAPOLEON had been opposed on previous occasions with success.

Allies takes Wischau,

An allied council of war was held on the 27th, and it was decided to attack at once. On that day, therefore, the army advanced in five columns with the intention of attacking the French *left*, and on the 28th it carried the French advanced post of Wischau.

and change their plans.

Believing now that the French meant to avoid a battle, and that NAPOLEON'S line of retreat would be the Brunn-Vienna road, the allies suddenly changed their plans and decided to turn the French *right*. They therefore forsook their line of retreat by Olmutz, and adopted a new one on Hungary.

Allies' plan of operations.

The allies continued their advance on the 29th. BAGRATION, with the van-guard of the right wing, was to occupy Rausnitz, the rest of the army to move to the left and fall on the French right; if successful, to change front to the right and occupy the ground between Turas and Schlapanitz. The right wing was to co-operate in the general attack on the French after their right had been turned, and be connected with the centre by LICHTENSTEIN'S Cavalry; they would then contain NAPOLEON on the Olmutz road while his right was again being turned, and thus, it was hoped, drive him into Bohemia.

Course taken by Napoleon.

Meanwhile the occupation of Wischau by the allies decided NAPOLEON, who retired his advanced posts, ordered up BERNADOTTE and DAVOUST to join him, and formed up his army between Turas and Lâtein. He soon discovered the plan of the allies, and on the arrival of BERNADOTTE and DAVOUST (who had made a forced march) he took his measures to meet the enemy. NAPOLEON saw the value of the Pratzen heights, but did not occupy them, because he knew that this would only lead to a contest with equal chances; he wished to strike a decisive blow, and therefore kept his army behind the Goldbach, merely leaving a detachment of cavalry on Pratzen.

Position of French on evening of Dec. 1st.

On the 1st December his army was in position, purposely left weak on the right, and concentrated at the left and centre. The left was on the Bohemian mountains and on the isolated hill of Santon, which was strongly held. The front of the position followed the line of the Goldbach. The right rested on the deep ponds of Menitz and Satschan. *See* Map II

Composition of French force. *Left.*

The left wing under LANNES consisted of—
Division SUCHET, 8 battns. (4 regts.)—south of Bellatitz.
,, CAFFARELLI, 10 battns. (5 regts.)—on right of SUCHET.
17th Regiment, infantry. } Under CLAPPAREDE—on hill of Santon.
18 Heavy guns (SÉNARMONT). }
8 Squadrons light cavalry on left flank watching Valley of the Dwaroschna.

Centre. Left centre under BERNADOTTE.
Div. DROUET. } 18 battns. (6 regts.) and 8 squadrons, near Schlapanitz.
„ RIVAUD. }

Centre. Right centre under SOULT.
Div. VANDAME... ... Between Puntowitz and Girzikowitz }
„ ST. HILAIRE ... „ „ „ Kobelnitz. } 31 battns.
„ LEGRAND ... „ Chateau „ Telnitz. }
Brigade LEVASSEUR (of DAVOUST's Corps)—on left of LEGRAND.
Brigade of cavalry, MARGARON, 6 squadns., watching front south of Pratzen.

Right. Right under DAVOUST.
Div., FRIANT, 10 battns. ... } At Abbey of Raigern.
Cavalry, BOURCIER, 12 Squadns. }

Reserve. Reserve under OUDINOT.
Grenadiers, 10 battns ... } Between Schlapanitz and Bellowitz in rear of
Imperial Guard, 10 battns. } SOULT and BERNADOTTE.
Cavalry, RAPP—9 squadns. }

Reserve. Reserve cavalry, MURAT, 44 squadns.
D'HAUTPOUL and NANSOUTY—on each side of main road.
KELLERMANN, WHALTER and BEAUMONT in advance.

The batteries attached to each division were placed in the brigade intervals.

Strength of units. 1 corps = 2 divisions = 4 brigades = 10 regts. = 20 battns. = 11,000 men.

The two odd regiments were light infantry.

Infantry. There were 97 battalions = 54,000 men roughly.

Cavalry. A squadron may be taken at from 100 to 120 sabres.
3 squadrons = 1 regt. of cavalry.
There were 87 squadrons (according to some, 123).
The force of cavalry may therefore be estimated at 12,000.

Artillery.

Each of the 10 infantry divisions had	10	guns	= 120.
To the cavalry of each corps	6	„	= 18.
To the reserve cavalry	15	„	= 15.
To cavalry of the Guard	12	„	= 12.
In reserve	12	„	= 12.
Heavy guns	18	„	= 18.
Total guns			195.

The proportion of guns per 1000 men was two and a half.

Total strength. The total French force therefore may be taken as 54,000 infantry, 12,000 cavalry and 195 guns.
(Marbot gives 68,000 men).

Allied army on 1st Dec. On the 1st December the allies debouched from Austerlitz and took position opposite to the French army at a distance of two to two and a half miles. Their right was on the mountains near Kowalowitz, centre *See* Map II about Pratzen, left at Augezd. Thus, as will be seen by the dispositions, the first four of the five allied columns were to extend over five miles of country, while the rest of the army was to remain opposed to the concentrated left and centre of the French.

Disposition left wing under Buxhowden. (1st, 2nd and 3rd columns.)

The van-guard of the left wing under Kienmayer, five battalions and 32 squadrons, passed Pratzen and took up a position before Augezd. They were ordered to patrol towards Menitz and Abbey Raigern.

The 1st column under Doctoroff, 24 battalions of Russians and 12 guns, moved by Wazan, Scharalitz and Hostieradeck and formed on two lines on the heights from the latter place half way to Pratzen, having taken possession of Augezd.

The 2nd column under Langeron, 18 battalions of Russians, two squadrons and 12 guns passed by Kreznowitz and formed on right of 1st column. They were destined to cross the Goldbach at Sokolnitz.

The 3rd column under Prisbiziuski, 18 battalions of Russians, two squadrons and 12 guns left Austerlitz on their left hand and deployed in one line between Pratzen and Blasowitz. They were to cross the Goldbach at Chateau.

Centre under Kutusoff. (4th & 5th columns.)

The 4th column, composed of 12 battalions and two squadrons of Russians under Miloradovich, and 15 battalions of Austrians under Kollowrath with 18 guns, moved north of Austerlitz by Hollubitz and formed in rear of the 3rd column. It was to cross at Kobelnitz.

The 5th column under Lichtenstein, 82 squadrons and 40 guns, followed the 3rd column and formed on two lines behind Pratzen in rear of the first three columns. It was ordered to leave the centre and support the right by marching towards the Brunn road.

The Guard in reserve under Grand Duke Constantine, 10 battalions, 18 squadrons and four guns formed in two lines north-west of Austerlitz on the left of the high road to Brunn.

Right under Bagration.

The van-guard of the right wing under Bagration, 12 battalions, 40 squadrons and 24 guns (Austrians) formed across the Brunn-Olmutz road in two lines between Hollubitz and Kowalowitz. It was to attack the French left on Santon.

The Emperor of Austria and head-quarters were with Kollowrath.

Strength etc.

Total, 114 battalions, 178 squadrons. A battalion consisted of about 550 men, and a squadron of 100.

Though the allies had somewhere about 300 guns, only 122 appear to have been brought into action; the remainder being probably kept in reserve to come on behind and support the second phase of the battle should the turning movement be successful.

80,500

Thus the total strength of the allies may be taken at about 62,700 infantry, 17,800 cavalry and 122 guns. Proportion of guns roughly, two to 1000 men. (Marbot gives the strength as 92,000).

It will be seen therefore that the allies were stronger in infantry and cavalry, and weaker in guns than the French.

Allies orders or the attack.

The attack by the allies was to be in oblique order. All were to start at 7 a.m.; each column, after passing the defiles, to await the arrival of the next on the left before going further. The whole line of battle to be regulated by the movements of the left wing. Line of retreat, Hogieditz and Herspitz.

Description of Battle-

The battle-field may be said to be contained within a radius of five miles from the village of Pratzen. There is a long range of wooded hills running north of the Brunn-Olmutz road. Country, undulating; the highest ground is about Pratzen, the principal heights being Stari

Winibradi and Pratzen. West of Pratzen and running in a southerly direction is the Goldbach, formed of two small streams which unite at Puntowitz. It is studded with villages which were of great importance to the defence. There are numerous ponds, of which the three most important are those of Menitz, Satschan and Kobelnitz. They were frozen over on the day of the battle.

Ground generally.

The valleys were wooded, with marshy bottoms intersected by small streams and numerous defiles. The ground north of Stari Winibradi was good for cavalry and artillery. From Santon northwards it was difficult for cavalry. The ground about Turas, admirable for all arms, and affording every facility for manœuvring on an extensive front.

The French on morning of Dec 2nd.

Napoleon, who spent the evening of December 1st going round his advanced posts by torchlight (being received with the greatest enthusiasm), saw that the allies had fallen into the snare he had laid for them, and, assured of success, he, that night, issued to his troops the memorable order, detailing his plans and promising them victory.

Marbot says that Napoleon's plan was to induce the allies to attack his apparently weak right about Telnitz, over marshy ground, whilst he had Davoust with a strong force hidden behind Raigern.

French right.

He therefore only left Legrand's division to cover the entire space from Puntowitz to Telnitz. In the latter he placed three battalions, and two in Sokolnitz and Chateau, also one brigade before the defile at Kobelnitz in two lines, the first deployed, the second in column. Thus, from Sokolnitz to Telnitz, 3000 yards, there were only 8000 infantry, 2600 cavalry and 24 guns opposed to four times that number. This was, however, only intended as a "retarding force," and to give time for the real work of carrying the centre.

Centre.

Soult's force was supported by Bernadotte and the Guard.

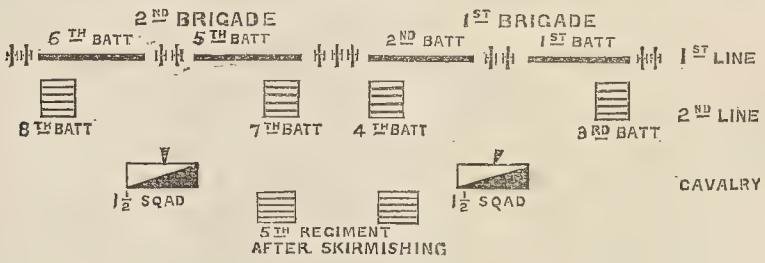
Left.

On the left, the ground between Santon and Girzikowitz, 2000 yards, was open to attack and very important. Napoleon therefore placed Lannes there with 11,000 infantry, eight squadrons and about 30 guns, a force quite suited to the space.

Tactics of French.

Napoleon adopted a new formation for attack on this particular occasion as follows:—

A division advanced in two contiguous brigades of four battalions each, the front line deployed, the second in battalion columns at deploying intervals. Behind the intervals of the battalion of the second line was a squadron or a squadron and a half of cavalry. The two battalions of the 5th Regiment of the division first skirmished to open the way for the advance of the division, they then unmasked its



front, withdrew by the flanks, and followed in rear of the centre of the

division as a reserve. Some guns were in the intervals of the first line, the remainder on the flanks.

The Emperor, writing to SOULT and BERNADOTTE, with reference to the above, said, "You will, by observing this formation, be able to oppose a line of fire to the enemy, and yet have close columns ready to attack him if requisite."

Tactics of allies.

The allies followed the tactics of Frederick the Great, viz., the line formation, oblique to that of the enemy and out-flanking it. For this purpose they marched their infantry up in two open columns of companies, in a direction perpendicular to the enemy's line, and then wheeled into two lines against him. This is fully described in "Home's Précis of Tactics." As will be seen later, NAPOLEON in this battle overthrew Frederick's system by meeting it in front and attacking it in flank.

2nd Dec., 1805. Commencement of the action.

The morning of December 2nd was so misty that NAPOLEON could tell nothing of the movements of the allies until after 7 o'clock, when the fog lifted, and it appeared to him that the Pratzen heights were abandoned by the enemy, who seemed to be extending from the centre towards the left and right on Telnitz and Hollubitz respectively. He therefore only awaited the proper moment to attack the centre of the allies.

Operations on left wing of allies.

According to instructions, the 1st, 2nd and 3rd columns of the allies began their march at 7 a.m. They were on a front of sub-divisions, 20 men in a rank, so that, with artillery and cavalry, the 1st column must have stretched about three and a half miles. There was one mile between the 1st and 2nd, and 1500 yards between the 2nd and 3rd column. Between the 3rd column and Blasowitz (four miles) there were therefore only 15,000 infantry.

The course of the battle was as follows:—

Telnitz and Sokolnitz taken and retaken.

KIENMAYER advances on Telnitz, the heights being defended obstinately by LEGRAND with four battalions, but KIENMAYER receives reinforcements from the 1st column (DOCTOROFF), and the French retire. Napoleon orders DAVOUST to check the advance of the allies, but before he can do this, the 2nd column (LANGERON) and the 3rd (PRISBIZIUSKI) carry Sokolnitz.

7 a.m. to noon, *see* Map III.

DAVOUST, who had left Abbey Raigern, and was now behind the pond of Ottmarau, sends assistance. Telnitz is retaken by the French, but again carried by the allies. The 1st column deploys on the French side of the defile and halts for the 2nd column.

DAVOUST now leaves his cavalry to observe the 1st column and retakes Sokolnitz, is out-numbered and has to give it up. The allies commence to deploy beyond Sokolnitz. It is 9 o'clock.

9 a.m. Operations at centre.

Napoleon, seeing Pratzen heights almost deserted, orders SOULT and BERNADOTTE to attack the centre; the former to storm the heights, the latter to move on Blasowitz. At this moment the allies' 4th and 5th columns are behind Pratzen. The 4th, on the point of moving off from the left, see the French advancing, and hurriedly reform. MILORADOVICH deploys to right, KOLLOWRATH to left. KAMINSKY'S Brigade of the 3rd column, which was the last to move off, is recalled and forms on the left. LICHTENSTEIN (5th column), who had

tried to move his cavalry to the right as ordered, but had been delayed by the infantry marching off, had sent 10 squadrons under OUVAROFF to support BAGRATION. These crossed the front of the advancing reserves (CONSTANTINE) causing delay and confusion.

Attack of allied centre.

SOULT attacks with such impetuosity that the allies cannot withstand it. ST. HILAIRE on the right and VANDAME on the left of Pratzen, overthrow MILORADOVICH and KOLLOWRATH respectively. KAMINSKY on the left and six battalions on Stari Winibradi attempt to make a stand but are driven off by ST. HILAIRE, supported by LEGRAND and VANDAME.

11 a.m.

It is now 11 o'clock. The centre is pierced and the left wing of the allies is isolated. Under fire from the French guns on Pratzen heights, the allied centre retire by Wazan, on Herspitz and Hogieditz, protected by some of LICHTENSTEIN'S Cavalry, but having lost their guns in the heavy ground.

Allied centre dispersed.

The following shows the formation of St. Hilaire's Division at the moment of its attack of Pratzen heights.—("Home's Tactics").

The battalions previously deployed were formed in double company columns on the centre.

Operations on right of allies.

Meanwhile the French left wing have repulsed BAGRATION (who had made determined attacks on the Santon), as well as the charges of the Russian cavalry, and advance, supported on the right by MURAT. BERNADOTTE followed by OUDINOT advances at the same time as SOULT in contiguous close column of regiments, RIVAUD on left, DROUET on right.

The allied 5th column under LICHTENSTEIN is advancing on the left of the reserve under CONSTANTINE, which is now in the front line and opposed to CAFFARELLI and some of MURAT'S Cavalry under KELLERMANN. The French take Blasowitz. CONSTANTINE'S Uhlans attack and penetrate the first French line, but lose their leader (ESSEN), and are assailed on both flanks by CAFFARELLI and RIVAUD, who oblige them to retire in disorder. KELLERMANN distinguishes himself by his brilliant cavalry charges. The Russian Guard make a stand and their cavalry charges almost annihilate a regiment of French infantry, left on the plateau by VANDAME, but both guard and cavalry are routed by the French cavalry under RAPP and retire on Krzenowitz.

Allied reserve dispersed.

Marbot's description and anecdote.

Marbot graphically describes this cavalry combat. The French were led by BESSIERES and RAPP, and the Russian Horse Guards, composed of the flower of the nobility, fought desperately and suffered severely. The French Horse Grenadiers in particular engaged them, and as they sabred them, shouted, "*Faisons pleurer les dames de Saint Pétersbourg!*"[1] General MORLAND was killed in this charge, and Marbot

[1] The painter Gérard has made this charge the subject of his picture of Austerlitz, and has chosen the moment when Rapp covered with his own blood, and that of his enemies is presenting the Emperor with the standards which the French cavalry captured. Marbot, who was himself present at the scene, says that the heads are all portraits, even that of the brave *Chasseur à Cheval*, who fell dead at Napoleon's feet in the act of presenting him with a standard which he had captured.—("Mémoires du General Baron de Marbot," Chapter XXVI.).

relates how Napoleon, wishing to show his admiration, ordered the body to be sent to Paris to be buried in the Invalides. To preserve the body, the doctors, in the absence of embalming materials, put it in a cask of rum and sent it to Paris, where, owing to force of circumstances, which delayed the building of the tomb, the cask with its contents remained forgotten in the School of Medicine till 1814, when it came to pieces from decay and the body was disclosed. It was noticed with surprise that the action of the rum had made the deceased General's moustaches grow to such a length that they reached below his waist! The body was perfectly preserved, and owing to its having become valuable as a curiosity, the family had to go to law before they could get it back! This is Marbot's[1] story and therefore of course true!

Repulse of Bagration by Lannes.

On the extreme right of the allies, after the centre has been defeated, Lannes moves forward with his 1st brigade deployed, and his 2nd following in quarter distance column of battalions at deploying intervals. Murat repulses Ouvaroff whilst Caffarelli and Suchet separate him from Bagration. Ouvaroff charges Caffarelli unsuccessfully and is driven to Austerlitz by the cavalry division of d'Hautpoul and Nansouty. Lannes then falls on Bagration and forces him to retire along the Olmutz road to Rausnitz. The French take Kruh and Hollubitz. It is noon.

12 Noon.

Operations on allied left.

After defeating the allied centre, Soult changes front to the right and advances against the allied left, having been reinforced by Beaumont's Dragoons. His place on the plateau is taken by Bernadotte and Oudinot. Sokolnitz and Chateau are captured from the allies; the 1st and part of the 2nd column of the allies fly to Augezd, the 3rd and part of the 2nd try to escape by the pond of Kobelnitz, into which some are driven; the remainder pursued by Margaron's Cavalry surrender to them and to part of the reserve sent by Oudinot to support Legrand. Prisbiziuski is stated to have surrendered with 113 officers and 6000 men.

Noon to 4 p.m., *see* Map IV.

2 to 3 p.m.

The 1st column tries to escape by Augezd, but the bridges over the stream give way. Vandame descends from the heights and cuts the column asunder, Doctoroff rallies the *débris* and retires towards Telnitz. Taken in front by Soult and in flank by Davoust, there is no chance for the unfortunate allies, and but one line of retreat, viz., by the dam between the ponds of Satschan and Menitz. Part of the column escapes to Ottnitz, the remainder takes refuge on the ice of the ponds, but the weight on the ice, and the French Guards' artillery fire which Napoleon purposely ordered to play on it, break it. Marbot describes this terrible scene most vividly, and states that some 5000 horse, foot and artillery perished. He states that he nearly lost his own life in rescuing an unfortunate Russian officer, under the eyes of Napoleon, who was desperately wounded and was clinging to an ice floe.

End of the battle, 4 p.m.

It is now 4 p.m, and the left wing of the allies is completely routed.

[1] Marbot's remark on this incident is characteristic. He says, "*Aimez donc la gloire, et allez vous faire tuer pour qu'un olibrius de naturaliste vous place ensuite dans sa bibliothèque, entre une corne de rhinocéros et un crocodile empaillé!*"

The French sleep on the field they have so gloriously won, and the shattered remains of the allies, under cover of the night, retire by the road to Hungary.

Losses. The allies lost in this battle about 25,000 killed, wounded and prisoners, some 200 guns, 45 standards, etc.

The French lost 8000 to 9000 killed and wounded.

Peace signed. On December 4th an armistice was signed, followed on December 27th by the Peace of Presburg. Austria retired from the coalition ceding some territory and paying an indemnity of 100 millions of francs (£4,000,000).

COMMENTS.

Comments. This battle may well be quoted as one of the most decisive in the world's history, and as a triumph of the genius of Napoleon. The causes of the defeat of the allies are not hard to discern, and may be briefly summed up as follows:—

Faults of allies. (1.) The allied army was composed of two different nations, both the Emperors being present, and although KUTUSOFF was in actual command of the army, still he was bound to be subject to their wishes. General WEIROTHER, the chief of the staff, though doubtless an able man in many ways, was over confident, did not try to make himself acquainted with the strength and movements of the French, and therefore, however good his plans would have been, had his premisses been correct (instead of their being in the present case, utterly wrong) they were now worse than useless. Instead of distributing his army over such a large front, he should have concentrated it near the main road north of Blasowitz in order to try and drive the French away from Brunn and open out communications with the army of Archduke FERDINAND, who was advancing on Iglau. But knowing that NAPOLEON was hemmed in with enemies, and that Prussia was ready to take up arms against him, it would have been far better for the allies not to have risked a battle and to have waited for help. It is quite posssible however, that, had the allies given battle earlier, before DAVOUST had come up, or had they waited a fortnight to allow the large reinforcements under Archdukes CHARLES and JOHN (some 80,000 men) to come up, they would have had much better chances of success.

No attempt to conceal their movements. (2.) As regards the movements of the allies, they had in Pratzen a position behind which they could have masked the movements of their troops; but we find them making their turning movement in broad day-light, the destination of their columns being perfectly apparent. They thereby played into the hand of NAPOLEON, who saw them weakening their centre and separating their two flanks. KUTUSOFF should have avoided making the turning movement an isolated attack, by supporting his left in prolonging the centre and right. The turning force had seven miles to go, over a country which, from its nature, gave an advantage to an inferior force. There was a long distance

Danger of isolated attacks.

between the columns which extended over a great length of road.

When making an oblique attack, as the allies did, the continuity of the line should be maintained throughout the advance, otherwise the flanks, which are the weak points of the line, are multiplied.

Allied artillery badly employed.

(3.) The allies managed their artillery very badly; they had a superiority in that arm, but made no use of it. A large number of guns were left behind, and from the meagre accounts we have of the part played by the artillery, it would appear that they moved it in rear of the infantry, thereby hampering the action of the guns. When the artillery of the left wing was required to act, the guns could not be brought to bear upon the French until the latter had taken the allies in flank. The reserve was weak and engaged in the front line, when repulsed there was no further support to fall back on.

Reserve ditto.

(4.) The allies had their left flank resting on the ponds of Menitz and Satschan. When the centre was broken all the intervening troops were rolled back into this flank and destroyed.

Reasons for French success.

If now, on the other hand, we consider the plan and tactics adopted by the French, we find that NAPOLEON succeeded in deceiving his enemies, and actually managed to make them fall in with his scheme. He selected a central position and concentrated his troops there unseen by the allies, and ready to fall on their centre as soon as he gave the word. When his troops did advance he saw that they were properly supported and kept perfect touch between the different parts. He really possessed a defensive position and the allies an offensive one, but, as it turned out, this order of things was actually reversed.

Advantages of new French tactics.

His new formation for attack was eminently successful and specially adapted to overthrow the *line* formation. In it the action of the three arms was combined to the greatest advantage. He could readily form front to a flank, each portion was independent and could act as a reserve to the other. The general had his divisions well under control, owing to the length of front being not more than 800 yards. NAPOLEON, while directing and planning the whole of the arrangements for the attack, gave his generals commanding corps the power of using their own discretion as to how they advanced on the different natures of grounds. Thus we see SOULT, LANNES and BERNADOTTE, though employing practically the same system of tactics, advancing nevertheless in different formations suited to the ground. NAPOLEON employed skirmishers, and doubtless with advantage. Though the enemy might harass the flanks of his infantry with their cavalry (as in LANNES' case), his cavalry, which was in rear of the centre of the brigade, could protect the infantry, and, when occasion offered, it could advance through the intervals and pursue. We find, on the other hand, that the allies used their cavalry in the first line and trusted to it to fill gaps. Did it succeed in piercing the front line of the French, it was met by a steady fire from the second line which formed battalion squares.

Independent action allowed to chiefs of corps.

Skirmishers.

Allied cavalry.

French artillery.

The French guns, well protected by their position in the front line, co-operated in the force of the attack by reserving their fire until at close ranges when it must be effective; they also took up good positions.

Reserve. The reserve hardly fired a shot, but it was ready at any moment, and supported the rest of the army.

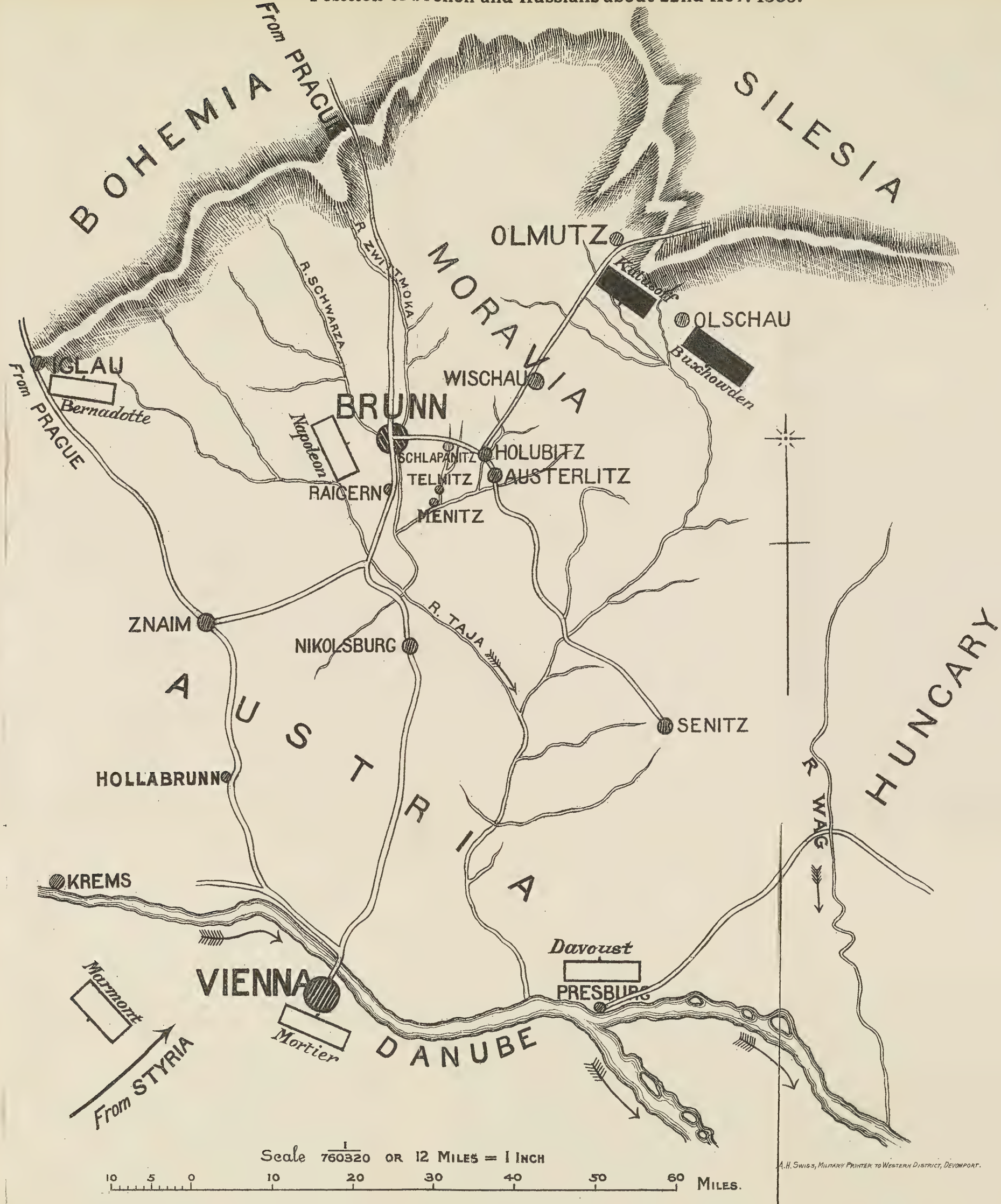
Well might the Russian General LANGERON (commander of the 2nd column) exclaim, "J'avais vu déjà quelques batailles perdues, je n'avais pas l'idée d'une pareille défaite."

N.B.—The maps to illustrate this lecture have for economy, been reduced by photography from the large diagrams used for the lecture. Allowance must therefore be made for their execution.

French an

MAP I.

Position of French and Russians about 22nd Nov. 1805.



A.H. SWISS, MILITARY PRINTER TO WESTERN DISTRICT, DEVONPORT.

MAP

ending

Dec. 1st,

1/74880 OR

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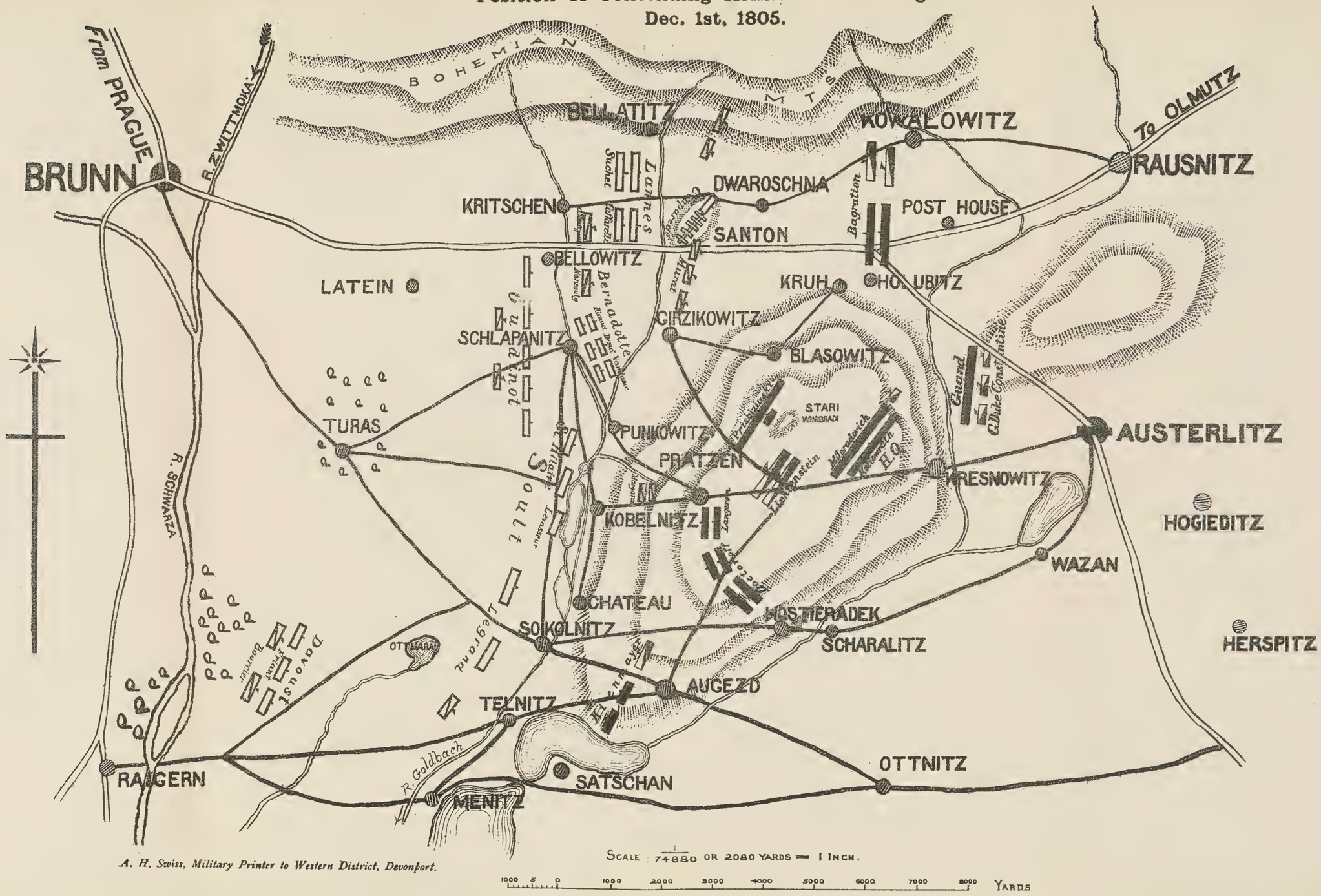
MAP II.

Position of Contending Armies on Evening of Dec. 1st, 1805.



SCALE $\frac{1}{74880}$ OR 2080 YARDS = 1 INCH.

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7 a.m. to


GIRZI
PUNKOWITZ
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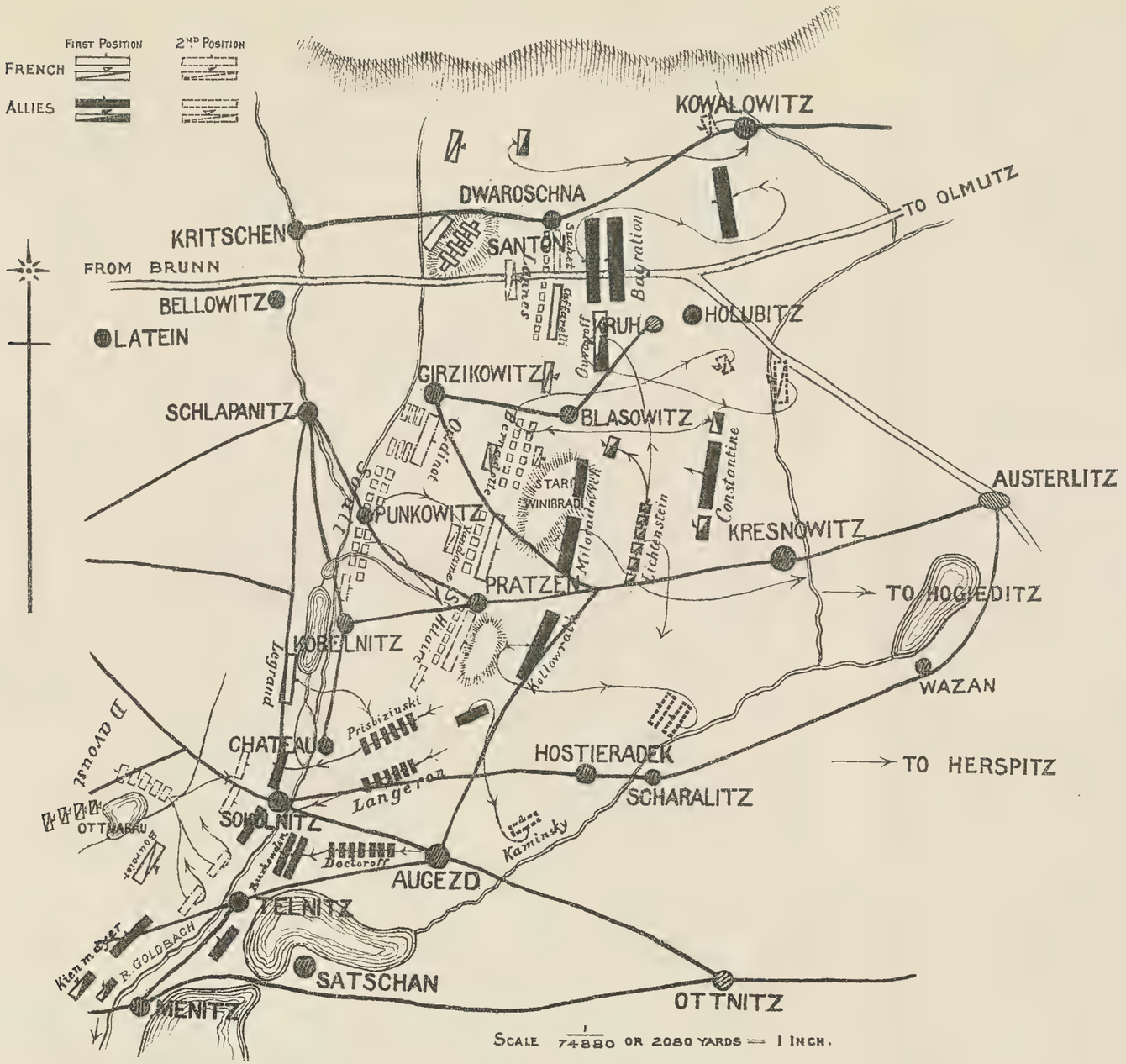
MAP III.

7 a.m. to Noon, 2nd Dec. 1805.



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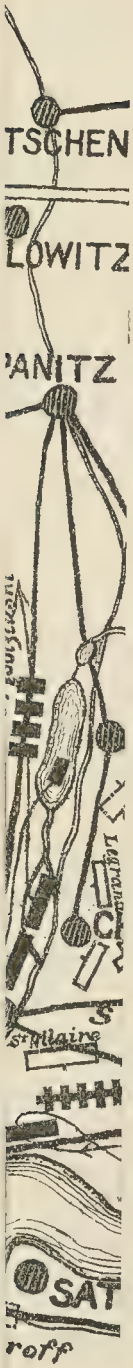

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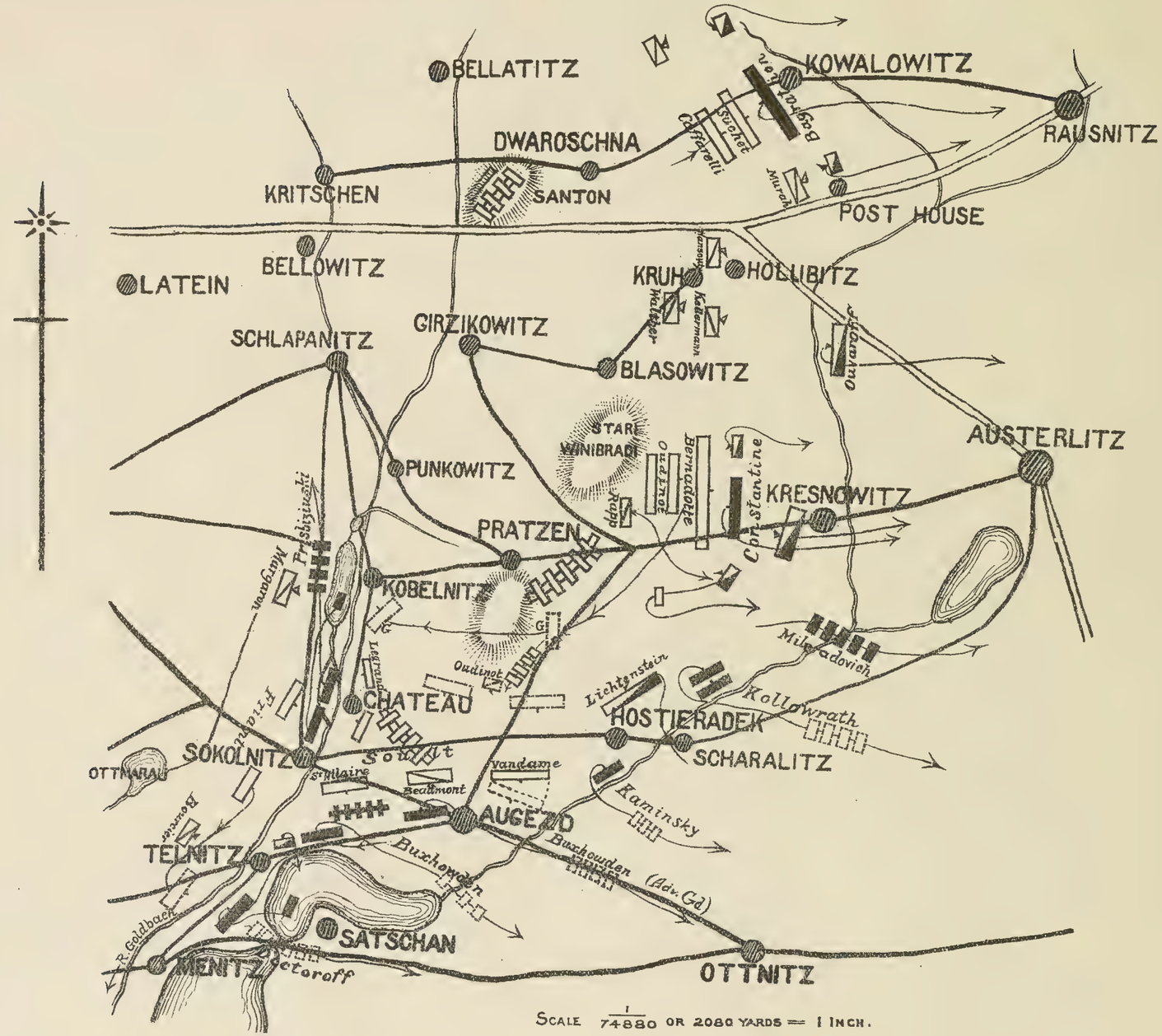
MAP IV.

From Noon to 4 p.m., 2nd Dec. 1805.



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THE CAUSES OF DRIFT OF ELONGATED PROJECTILES FIRED FROM RIFLED GUNS.

BY

MAJOR-GENERAL C. H. OWEN, (LATE) R.A.

(A Lecture delivered at the Royal Artillery Institution, Woolwich, Monday, 3rd February, 1896.)

COLONEL E. BAINBRIDGE, SUPERINTENDENT ROYAL LABORATORY, IN THE CHAIR.

THE CHAIRMAN—Gentlemen, to those who do not already know him let me introduce Major-General Owen, formerly professor of Artillery at the Royal Military Academy, Woolwich. He instructed a great many of us in the principles of artillery and initiated us into its mysteries of drift, and on this subject he has kindly consented to give us a lecture to-night and especially invites discussion. (Applause.)

MAJOR-GENERAL OWEN—Colonel Bainbridge and Gentlemen, it is a great many years since I read a paper on the same subject that I am going to bring before you to-night, and the majority of you may rather wonder why I want to repeat so much after such a number of years and when so much has been done in the meantime. But when I was leaving the Royal Military Academy, in 1873, a brother officer who had just then come to the Gun Factories, and had some opportunities of carrying on practice with proof shot, made an attempt to controvert what was supposed to be established at that time; and some experiments that he made then have been since taken as a proof, that what he professed to call the theory of the thing before held was all wrong. Well, I do not want to dogmatise, or to make out that my explanation is the only true one; at the same time, so far as I know, what I am going to say to-night as regards drift was accepted some years ago. It has never seriously been challenged by anybody of any authority, nor have any experiments been made since my own which would invalidate what was done then. I do not know of course now, having left the regiment for some time, what you gentlemen do as regards these kind of questions; whether you care much about them or whether you do not; in fact I am very much flattered at seeing so many here to-night, who have come to listen to perhaps a very elementary thing. I do not

know how much you have gone into this, but I think that so far as regards what I want to bring before you it is pretty simple, and I think I shall be able to make out my case by the results of experiments.

In the "Text Book of Gunnery, 1887," written by Major G. Mackinlay, R.A., the question of the *Drift* of projectiles fired from rifled guns is treated in rather an unsatisfactory way, the subject being summed up as follows :—

"In the present state of our knowledge it is impossible to give reasons for drift which will be received by all, as different explanations have been given by various authorities." It is said in the preface (second edition) that the Text Book is not only used at the R.M. Academy, but that it has been "adopted for use in the Royal Artillery, and has also had a considerable circulation elsewhere." It is in fact the accepted Text Book of the service, as my "Modern Artillery" was for some years, the only difference being that the later Text Book is a strictly official work, while mine was an independent publication accepted officially. This being the case, it is somewhat surprising, that what was considered well-establised by competent authorities should be ignored in the Text Book, and that no notice whatever is taken of the experiments carried out by Professor Magnus, of Berlin, or of those by myself ; also of the results of practice made independently, which serve to confirm what had been ascertained from the former.

On visiting Shoeburyness not long ago I was informed by an Officer in authority there, that, although I might not credit it, the drift was due to the projectile rolling on a dense layer of air below it. That this *rolling* may have some effect is probable,* but when projectiles with right-handed rotation deflect in certain cases to the left, it is obvious that we must look elsewhere for the chief cause. The writer of the Text book recognizes the inadequacy of the theory, for he says :—"But this simple explanation will hardly account for the facts that rifled projectiles are not overturned in flight, and that their axes are kept nearly tangential to the trajectory." Why then does he make no allusion to the ample evidence given in "Modern Artillery," and in other works and papers to the *left* deflection or *drift* of cylindrical or flat-headed projectiles, fired with right-handed rotation ? not the so-called flat-headed shot having rounded shoulders, with which it was attempted to show that truly cylindrical shot drift in the same direction as pointed projectiles having right-handed rotation.

It may also be asked, who are the various authorities who have given different explanations ? No trustworthy experiments have been made since my own ; nor has any theory of any value been established, which could, in any way, affect the explanations of Professor Magnus, confirmed by many experiments.†

The only attempt, in this direction, as far as I know, was the suggestion of Lieutenant-Colonel Sladen in his "Principles of Gunnery,"—"that the axis of the projectile makes one or more complete gyrations round the trajectory, and that the drift with service projectiles is always to the right, because the first movement of gyration is in that direction ;"

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* I shall show further on that the rolling may produce effect on drift, when very low charges and high angles are employed.

† The subject was treated mathematically by General Mayevski in a paper entitled—"De l'Influence du Movement de Rotation sur la Trajectoire des Projectiles oblongs dans l'air," in "Revue de Technologie militaire," tom. v., 1865. Paris et Liége.

but it is difficult to conceive that this reason for drift can be the correct one ; for if a complete gyration were made during flight, the projectile would be inclined, and therefore present more surface to the resistance of the air, first on one side and then on the other, and the consequent effects would be neutralized at the end of the range, but should show intervening right and left deviations. That the deflections are in one direction, and increase with the time of flight, is shown by ordinary practice tables.*

In dealing with the question, I will first restate the results of experiments, and the deductions from them, which it was generally acknowledged some few years ago, both at home and abroad, had sufficed to establish the correctness of the explanations of the cause of "drift," offered by Professor Magnus. After this I will give an account of some very unsatisfactory experiments, made with the object of proving that all shot, whether flat or round-headed, deviate in the direction of their rotation ; and my letter to the Secretary of the department of the Director of Artillery, exposing the fact of the so-called flat-headed shot fired, not being cylindrical in form, and the consequent worthlessness of the results ; and lastly, I will refer to the great effect upon drift, produced probably by the so-called rolling of the shot upon the dense air below it, in high angle fire.

It is known that elongated projectiles turn over in flight, when fired with high velocities without rotation, unless the centre of gravity be in or near the head ; and it was supposed for some time after the introduction of such projectiles for rifled arms, that the longer axis of the shot remained, during flight, parallel, or nearly so to its primary direction. This would be so with very low velocities, but it was found that with high velocities, such as those obtained from small arms, or ordnance, the point drooped during flight, that is, the longer axis assumed a position tangential, or nearly so to the trajectory. To show these effects of the turning over of elongated shot fired without rotation, of their steadiness with rotation, and the maintenance of the longer axis nearly in its original direction with very low velocities, an instrument† was made for me by Mr. Colbrook, Modeller of the R.M. Academy, and these effects were shown, by using light wooden or paper shot, constantly to the Cadets of the R M. Academy, also at the R.U.S. Institution, and at the R.A. Institution.

Spherical bullets were used for some years with rifled small arms, but they were superseded by elongated projectiles, which presented so much less surface to the resistance of the air during flight. It was found that with either form there was a constant deviation to the right or left, according as the gun had a right-handed or left-handed twist, giving right or left-handed rotation. This peculiar deviation has been called "derivation" by the French, and "drift" latterly in our service. The Tables‡ given below will serve to show the direction of the drift with guns giving right and left-handed rotation respectively.

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* This may be clearly seen in Table xiv., page 309, Text Book.

†This instrument is described in Appendix I. Major Mackinlay had a similar instrument made, and told me in a letter, that it answered its purpose very well, and asked if he should give it my name.

‡ From a paper on "The Derivation of Elongated Projectiles," by Major C. H. Owen, R.A. Proceedings of the Royal Artillery Institution. Vol. iv., page 180.

TABLE I.

Practice at Shoeburyness on 15th March, 1861, with shot from a 40-pr. Armstrong rifled gun giving *right-handed* rotation ; weight of piece 31-cwt., charge 5 lbs. Five rounds fired at each elevation ; no allowance for deflection in "laying."

Elevation.	Mean range.	Mean deflection.	
		Right.	Left.
°	yds.	yds.	—
2	1061	·06	—
3	1421	1·0	—
4	1769	3·6	—
5	2113	6·2	—
7	2687	16·4	—

The above are fair average deflections and have not been chosen as being favourable to the statement—that right-handed rotation gives right deflection to projectiles with pointed or round heads. It is found as may be seen from this table and from others further on, that with this gun the derivation is hardly sensible at 1000 yards., and also that at this range a wind blowing across the line of fire from right to left may not only counteract the derivation but even deflect the shot to the left ; as however the range increases, the right deflections become very apparent.

TABLE II.

Practice at Shoeburyness on 9th April, 1862, with shot weighing about 60-lbs., from a 32-pr. gun rifled on a French principle, and giving *left-handed* rotation ; charge, 5·5-lbs. Fifteen rounds fired at each elevation ; no allowance for deflection in "laying."

Elevation.	Mean range.	Mean deflection.	
		Right.	Left.
°	yds.	yds.	yds.
2	824	—	1·5
5	1672	—	6·1
10	2891	—	19·8

Of the 15 shot fired at 2°, two deflected to the right, one had no deflection, and the remaining eleven deflected to the left. All the shot fired at 5° and 10° deflected to the left, the deflection increasing with the angle of elevation.

Professor Magnus, of Berlin, made a number of careful experiments some years ago, with both spherical and elongated projectiles, to ascertain the causes of deviations in flight ; but it will be necessary here to refer only to those with the latter. Before going on to these, however, it will be advisable to consider how the resistance of the air acts upon

an elongated projectile, and as the effect of the pressure differs according to the shape of the head, both a conoidal point and a flat head are given.

It is evident that immediately after leaving the bore of a gun, the shot commences to descend, and the centre of gravity must follow a downward course; consequently the resultant of the air's resistance must act below its point if conoidal, or the centre of the head if a flat-headed.

In Figs. 1 and 2, R acts below a, and is half-way between the dotted lines, which include between them a space representing that occupied by the opposing current of air.

Fig. 1.

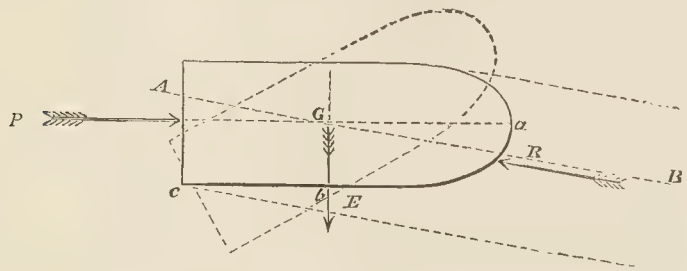
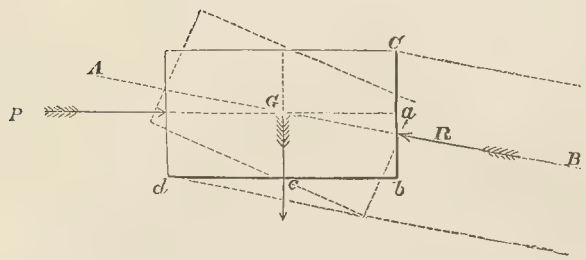


Fig. 2.



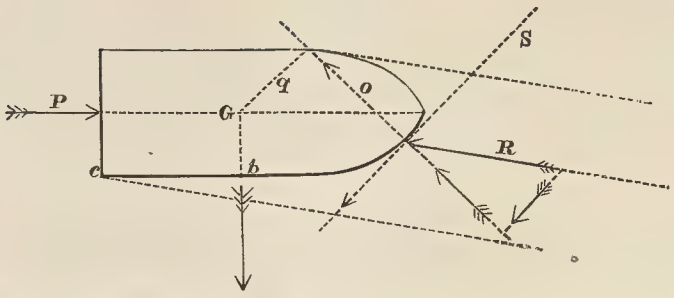
P represents the force of projection.
G „ „ gravity.
R „ resultant of the air's resistance, which must be parallel to the trajectory AB described by G, the centre of gravity of the shot.

The effect of R in Fig. 1, is to give the shot a rotation round its shorter axis, the point being turned up, as shown by the dotted lines. In fact, a pressure exerted anywhere, and at any angle, between a and b, that is, before and below the centre of gravity G, will raise the point; and a force exerted behind and below G, between b and c, will depress the point, no matter whether G is placed in the middle, or nearer either end of the shot.

Now, in Fig. 2, the pressure R will not raise, but depress the head, as shown by the dotted lines; and if R acts anywhere between a and b, the same effect will be produced, but if R acts between b and c, the head will be raised, as with the cylindro-conoidal shot in Fig. 1.

The way in which the resultant of the air's resistance acts upon the shot, may be further explained thus—Resolve R into two forces, O and S, Fig. 3, the latter acting in the direction of a tangent to the curve, and representing the friction between the air and the surface of the

Fig. 3.

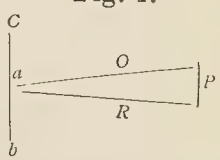


shot, which is therefore small. The former, *O*, acting as normal to the tangent, and representing the resisting force of the air, which causes the movement of the head of the shot. Draw *q* from *G*, perpendicular to *O*; then *Oq* is the moment tending to turn the point up, and will continue to act until *O* passes through *b* at right angles to *cb*.

If the pressure *R*, acting upon the flat head below *a*, be resolved, the component *O* pressing perpendicular to the end *Cb* of the shot, and therefore parallel to its long axis, will pass below the centre of gravity.

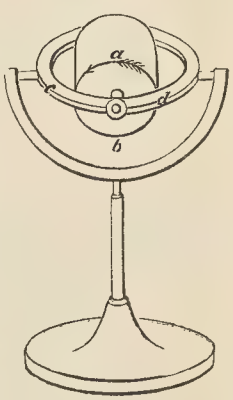
The component *P* parallel to *Cb* represents merely the friction between the air and the surface of the end, and is therefore very small indeed compared to *O*, the resistance opposed to the motion of translation.

Fig. 4.



These effects may be demonstrated practically by means of a *gyroscope*, Fig. 5, provided with a small elongated shot, instead of the disc used for ordinary experiments. The projectile must be made with the greatest care, so that its centre of gravity coincides exactly with that of the two rings within which it is placed: the rings are so arranged that one can turn round a vertical axis, and the other round a horizontal axis, the projectile being therefore free to turn in any direction. A cylindrical portion of metal extends beyond the base of the shot, in prolongation of its longer axis, round which the string is wound to give the required rotatory motion to the projectile.*

Fig. 5.

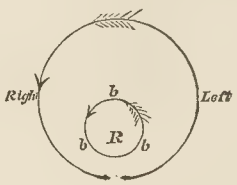


As the shot in the gyroscope has no motion of translation, a strong current of air must be directed upon it, so as to represent the resistance of the atmosphere to a projectile moving with a high velocity. The diameter of the nozzle of the blower should be equal, or perhaps rather larger than that of the shot, and the centre of the blast should be directed below the point of the shot, in the position indicated by *R* in Figs. 1 and 2.

* I had such a gyroscope made by one of the best instrument makers in London, I daresay it is at the R.M. Academy still; also a blower, from which a strong blast of air could be directed on the shot.

If Fig. 1 represent the pointed projectile of the gyroscope, it will be found that a pressure of a pencil or pen, or of a blast of air exerted anywhere between *a* or *b*, will as before explained raise the point when the projectile is not rotating ; but if the pressure or blast of air be directed in like manner when it is given a rapid right-handed rotation, the point will move slowly to the right (*see* Fig. 5, representing a front view of the shot). Then as, by the point moving towards the right, the force will gradually act on the left of the projectile, its point will gradually droop ; as this motion proceeds, the force will come to act above the point, which will cause it to move to the left and finally acting on the right the point will rise. In fact, as long as the rapid rotation and the pressure continues the point will describe a slow circular motion* (*b. bb.*, Fig. 6.)

Fig. 6.



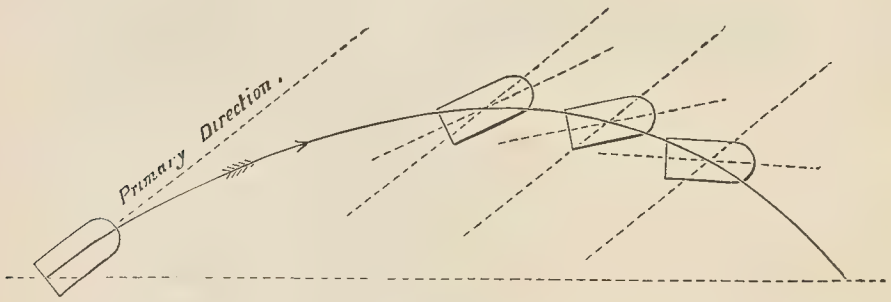
Let us now examine the effect produced on a flat-headed projectile ; and for this purpose, the flat base, instead of the pointed head of the shot of the gyroscope, must be subjected to pressure by touch or blast. When such pressure is exerted below the central point, the flat end (or head) will not rise as with the pointed head, but will as before explained droop (*see* Fig. 2). If now the projectile be given a rapid *right-handed* rotation, as with the pointed shot, the pressure will be found to cause the flat head to move to the left instead of to the right, the consequence being that the slow circular motion of the head proceeds in the opposite direction.

To apply these observations practically. If a pointed projectile having a right-handed rotation, be fired with a high velocity, the resultant of the air's resistance, which would tend to raise the point if the projectile be not rotating, will, it must be evident from what can be observed with the gyroscope, give the point a lateral movement to the right. As this lateral movement of the point proceeds, so will the resultant act more and more to the left of the vertical plane, passing through the longer axis of the projectile, and therefore, as with the blast or the pressure acting on the gyroscope, the point will soon begin to droop. In fact, there is very little doubt but that the longer axis of an elongated shot does not remain parallel to its primary direction, when the *velocity is high enough* to create considerable resistance ; but the point of the shot will first move to the right, then downwards, still keeping to the right, then to the left, and so on, describing a portion of the circle, the continuance of the motion depending upon the time of flight and the velocity maintained. As the velocity becomes low the

* For a more detailed account of such experiments with the gyroscope, and an explanation of the cause of this circular motion of the point, *see* "Modern Artillery," 2nd edition, page 251. In the "Text Book," the movements of the shot of the gyroscope are caused by attaching weight to the suspending rings ; but this is not so satisfactory or intelligible as the employment of a strong blast, which I used for years at the R.M. Academy.

circular motion of the point will gradually cease; but in ordinary practice* during the few seconds of flight which generally elapse, as the velocity is pretty high throughout, there is probably sufficient time and pressure not only to turn the point to the right, but to bring it down on to the trajectory. Practically, however, on account of the drooping of the point, the longer axis may throughout a considerable portion of the time of flight approximate *very nearly* to a tangent to the trajectory as in Fig. 7.

Fig. 7.



Professor Magnus said—"We deduce then from these experiments with the gyroscope, that the deviation of elongated projectiles arises from the fact that the resistance of the air has a tendency to raise their points. It is true that this raising is hardly sensible to the eye, because the forces which act upon the mass of the projectile are combined in such a way that the point, instead of being lifted, only moves on one side, and always to the right in the case of *right-handed* rotation.

Consequently, the projectile assumes an oblique position to the direction of the air's resistance, and is thereby in its further progress depressed on the side towards which the apex is turned, while the air's resistance acts against it as against an inclined plane, and thus produces the deviation.†

The instrument made for me by Mr. Colbrook,‡ shows these effects very clearly. When the projectile is fired without rotation, it turns over in flight, a pointed head being turned upwards, and a flat-head downwards.

When fired with rotation, the shot is prevented from turning over, and the velocity being very low, the axis remains parallel to its original direction.

There is however enough resistance to turn the head of the pointed shot to the right, and that of the flat-head to the left, with right-handed rotation, the range being too short to allow of the drooping of the point.

It will be found that the results of experiments on the practice ground, fully bear out the explanation given above of the chief cause of *drift*, and of the drooping of the point of an elongated projectile fired from a rifled gun, with a high velocity. The following experi-

* When the velocities are high and the angles of elevation low.

† Magnus on the Deviation of Projectiles, Berlin (1860), Second edition.

‡ See Appendix I.

ment was, at the suggestion of Professor Magnus, made by a Royal Commission, appointed to carry on artillery experiments at Berlin.* A number of projectiles were fired with a charge, and consequent velocity so low that an observer could follow them with the eye, and even note with accuracy the position of their axes ; the following were the results obtained :—

(1) All the observers stationed at intervals along the range unanimously agreed, that the axis of the projectile during the whole time of flight remained *nearly tangential* to the trajectory, but nevertheless that, in the descending branch, it was easily seen that the point of the projectile was a *little higher* than could have been the case had the axis remained *accurately tangential* to the trajectory.

(2) It was also admitted by all that, as much from the motion of the projectiles as from the furrows made in grazing the ground, in all the rounds fired, the point of the shot at the instant of touching the ground had a deviation to the right. (As shown in Fig. 8).

It follows from the results of these direct observations that, during the motion of translation of an elongated projectile, the axis does not only not agree exactly with the tangent, but that it makes a certain angle with the vertical plane drawn through this tangent, and that the deviation thus arising from this is to the right.

Many who are constantly employed in noticing the flight of shot assert most positively that when the velocity is not too high, they can clearly see the projectiles descend with their points downwards. It is difficult to say whether this is a mere optical illusion, but the effects, on targets, which can be examined at leisure, are more satisfactory evidence then that of the mere view of a shot during flight. Now it is almost invariably found that the holes made in targets are circular, even when elongated shot descend at considerable angles ; for instance, some 40-lb. shot fired at 7° and 10° of elevation, the angles of descent for which would be about 9° and 13° respectively, cut circular holes out of vertical targets made of thin wood covered with sheet lead. The most probable explanation of this fact must evidently be that the point of the shot had drooped during flight, so that, on striking, the longer axis was nearly perpendicular to the plane of the target. It would doubtless be most difficult to ascertain the exact position of the longer axis of a shot at any particular part of the trajectory, but this is hardly wanted ; for if at ranges generally required we can be pretty sure that the point will droop so as to allow the shot to strike nearly point first, there need be no fear but that the necessary practical results will be obtained. This drooping of the point is of importance, for did the axis remain parallel to its primary direction *during flight*, the projectile would, most probably, when fired at any but a very low angle, on striking an object of hard material and solid structure, as a wall, iron plate, &c., turn up against it lengthways, and therefore produce but trifling effect.

Fig 8.

We will now take the case of a flat-headed projectile, which it was shown by the gyroscope turns to the *left* with a *right-handed* rotation instead

* Magnus, on the "Deviation of Projectiles ;" and occasional papers of R.A. Institution, Vol. i., p 443.

of to the right, and should therefore deflect to the left, or, at any rate, more to the left than a pointed shot. Professor Magnus first pointed out the effect of the resistance of the air upon a flat-headed or cylindrical shot and after stating that their deviations would most probably be to the left, he says :—" I understand the experiments have already been instituted with such cylindrical projectiles and their results have confirmed this conjecture."

I am not aware what experiments Professor Magnus refers to here, but this conjecture had been confirmed by the results of practice at Shoeburyness, in November, 1858, with Whitworth flat-headed shot (not his later tapered form) showing, that five shot, fired at five degrees of elevation, all had left deflections varying from forty-five to seventy-two feet. The shots were fired from a 32-pr. gun, rifled on the Whitworth system, and giving right-handed rotatory motion to the shot ; the charge was 6-lbs., the ranges and deflections as below :—

Round	Range yds.	Deflection feet
1	2240	66 left
2	2090	54 „
3	2230	72 „
4	2180	60 „
5	2225	45 „

In order to obtain some confimation, Captain (now Lieutenant-General) Fraser, R.A., kindly fired some flat-headed bullets from an Enfield rifle, against service ones, at a range of 300 yards, in the Royal Arsenal, in March, 1862 ; in a series of 6 of each, 4 of the flat-headed bullets deflected to the left, two very widely, the other two, slightly to the right, while the service bullets were very near the line of range, 3 slightly right, and 3 slightly left. This was only a rough experiment, the flat-head being obtained by cutting off, and therefore shortening the service bullet, and the range was too short, for the flat-head would have required a much sharper twist to keep it steady, at a long range, still, the tendency of the drift to the left was apparent.

Wishing, however, for more satisfactory results, I obtained leave to have some service shot fired from a 40-pr. Armstrong gun, against the same number of specially made cylindrical, or flat-headed projectiles.*

Very calm days were selected for the practice, so that the results might be affected as little as possible by wind.

Both service and special shot were fired at each day's practice from the same 40-pr. Armstrong gun, mounted on a travelling carriage ; weight of piece 32-cwt., calibre 4·75-in., spiral (right-hand twist) 1 turn in 37· calibres, and number of grooves 56.

* I attended this practice myself, and it was carried out by Major (now Major-General Sir H. J.) Alderson, R.A., then Assist.-Superintendent at Shoeburyness. The tables of the practice, and the remarks on the results, were given by me, in a paper on the " Derivation of Elongated Projectiles," in proceedings of R.A. Institution, Vol. iv., page 180.

TABLE III.

Report of Practice. Shoeburyness, 22nd Aug., 1862.

Barometer,
Wind,—West, 3.
Direction of wind 

No. of round.	Elevation.	Projectile. Nature.	Projectile. Mean wght.	Time of flight	Range.	Deflection. Left.	Deflection. Right.	Remarks.
	o		lbs.	sec.	yds.	yds.	yds.	
1	1	Service shot	40·8	Not observed.	721	...	4	
2	,,		...		746	...	·8	
3	,,		...		768	...	1·2	
4	,,	Special shot	40·5		714	line.		
5	,,		...		743	...	1·2	
6	2	Service shot	40·8		1069	...	1·4	
7	,,		...		1054	...	1	
8	,,	Special shot	40·5		934	...	·8	
9	,,		...		989	·6		
10	5	Service shot	40·8		2092	...	1·2	
11	,,		...		2072	...	1·6	
12	,,		...		2101	...	2	
13	,,	Special shot	40·5		1611	4·4		
14	,,		...		1810	10·2		
15	,,		...		1617	9		
16	,,		...		1758	...	6	8′ deflection given so that axis of gun pointed along the range.
17	,,		...		1728	8·2		
18	,,		...		1662	5·6		
19	,,	Service shot ..	40·8		2005	...	7·4	

TABLE IV.

Report of Practice. Shoeburyness, 4th Sept., 1862.

Barometer, 29·8 in.
Wind,—East 3 to 4 in gusts.
Direction of Wind

No. of round.	Elevation.	Projectile. Nature.	Mean wght.	Time of flight.	Range.	Deflection. Left.	Deflection. Right.	Remarks.
	°		lbs.	sec.	yds.	yds.	yds.	
1	2	Service shot.....	41	not obs.	1025	...	1·	
2	,,		...	3·4	1099	..	1·2	
3	,,		...	3·4	1231	...	·8	
4	,,		...	3·4	1088	...	·8	
5	,,	Special shot. Centre of gravity towards base.	40·75	3·6	1102	1·4		
6	,,		...	3·6	1078	·8		
7	,,		...	3·6	1103	1·		
8	,,		...	3·7	1012	1·6		
9	,,	Special shot. Centre of gravity towards point.	...	3·4	1014	2·4		
10	,,		...	not obs.	1026	1·4		
11	,,		...	3·7	1068	3·2		
12	,,		...	3·7	1132	...	2·8	/ Elev. screw broke.
13	5	Service shot.....	41	6·7	2153	...	6·6	
14	,,		...	6·6	2211	...	7·2	
15	,,		...	6·6	2122	...	5·6	
16	,,		...	6·9	2177	...	8	
17	,,	Special shot. Centre of gravity towards base.	40·75	6·3	1710	6·2		
18	,,		...	6·3	1732	...	6·4	\
19	,,		...	6·6	1815	line		
20	,,		...	6·2	1691	5		
21	,,	Special shot. Centre of gravity towards point.	...	6·5	1739	·2		
22	,,		...	6·6	1774	...	1·4	/
23	,,		...	6·4	1775	...	3·2	/
24	,,		...	6·3	1658	10		
25	10	Service shot.....	41	11·8	3639	...	25	
26	,,		...	12·1	3649	...	26	
27	,,	Special shot. Centre of gravity towards base.	40·75	not obs.	2650	...	46	/
28	,,		...	11·8	2512	..	97	/
29	,,	Special shot. Centre of gravity towards point.	...	not obs.	2718	9	...	Sunk in sand.
30	,,		...	not obs.	2474	27·	...	Sunk in sand.

The gun was fitted with old pattern sights, and a constant deflection of 8′ right was given throughout the practice, so that the axis of the gun pointed along the range.

TABLE V.

Report of Practice. Shoeburyness, 9th April, 1864.

Barometer, 30·3 in.
Wind,—South-east, 2
Direction of Wind 

No. of round.	Elevation.	Projectile. Nature.	Projectile. Mean wght.	Time of flight.	Range.	Deflection. Left.	Deflection. Right.	Remarks.
	°		lbs.	sec.	yds.	yds.	yds.	
1	2	Special shot. Centre of gravity towards point.	47·0	2·9	890	2	...	/
2	,,		...	2·9	899	2·4	...	\
3	,,		...	3·0	900	4	...	/
4	3		...	4·2	1234	2	...	These shot were unsteady.
5	,,		...	3·9	1149	2·6	...	
6	,,		...	4·0	1215	2	...	
7	4		...	5·0	1396	4	...	
8	,,		...	5·2	1456	4·4	...	
9	,,		...	5·0	1398	2	..	
10	,,	Service shot.....	41·5	5·4	1795	line		/
11	,,		...	5·3	1751	line		/
12	3		...	4·0	1432	·4	...	/
13	,,		...	not obs.	1387	line		/
14	2		...	3·0	1014	line		/
15	,,		...	3·3	1024	·4	...	/

The gun was fitted with new pattern sights, and no allowance given for deflection, the axis of the piece pointing therefore along the range.

TABLE VI.

Report of Practice. Shoeburyness, 18th April, 1864.

Barometer,
Wind,—South, 2.
Direction of Wind 

No. of round.	Elevation.	Projectile. Nature.	Projectile. Mean wght.	Time of flight.	Range.	Deflection. Left.	Deflection. Right.	Remarks.
	°		lbs.	sec.	yds.	yds.	yds.	
1	2	Service shot.....	41·5	3·1	1018	8	...	/
2	,,		...	2·9	1014	1·6	...	/
3	3		...	4·2	1407	1·2	...	/
4	,,		...	4·0	1364	...	4	/
5	4		...	5·3	1755	...	2·2	/
6	,,		...	4·2	1706	...	1·6	/
7	,,	Special shot. Centre of gravity towards base.	47·0	4·6	1362	8	...	/
8	,,		...	4·6	1336	10	...	/
9	,,		...	4·5	1369	7·4	...	/
10	3		...	3·6	1093	6	...	Broken graze.
11	,,		...	3·9	1145	5	...	/
12	,,		...	3·7	1094	12·6	.	/
13	2		...	2·8	830	4·6	...	/
14	,,		...	2·8	821	4·4	...	/
15	,,		...	2·8	855	1·2	...	/

The gun was fitted with new pattern sights, and no allowance given for deflection, the axis of the piece pointing therefore along the range.

Taking the practice of the 22nd August, 1862.—Table III. first. The special shot fired on this occasion were those having the centre of gravity situated about midway between the apex and base of the shot. The results of the practice were not so satisfactory as might have been obtained, in consequence of the gun used having an inclined sight to allow for the *derivation* to the right of the service shot, and no allowance having been made for this right deflection until the 16th round ; still it can be seen from the Report, that when the angle of elevation was such as to ensure a sufficiently long time of flight, the deflections of the *special* (flat-headed) shot to the *left* were very decided. At 1° the time of flight was doubtless too short to allow of any apparent differences in the deflections, still the Report shows that the flat-headed projectiles did not deflect so much to the right as the conoidal pointed shot. At 2° the deflections of the former were also more to the left than those of the service shot. The wind blowing across the range from left to right might probably have caused all the shot fired to bear off slightly to the right. The 6 rounds from 10 to 15 fired at 5° proved however decisively that the flat-headed shot deflected to the left. Taking rounds 10 to 15 the mean deflections were,

	Mean deflections.
Service shot....	1·6 yds. right.
Special shot.....	7·8 „ left.

The mean deflections of rounds 16 to 19, when the allowance for the right deflection of the gun with service shot was taken off by giving 8′ right deflection (the axis of the gun pointing therefore along the range) were,

	Mean deflections.
Service shot	7·4 yds. right.
Special shot.....	2·6 „ left.

In firing No. 16 round there was probably some mistake in "laying," or perhaps the shot may have turned over in flight, for rounds 18 and 19 showed as clearly as before (13, 14, and 15) that the flat-headed shot deflected to the *left* ; if No. 16 round be omitted the mean deflection of 17 and 18 rounds will be 6·9 yds. left.

On the 4th September, 1862, an old pattern sight was used and 8′ right deflection given throughout the practice, so that the axis of the piece was not inclined to the line of the range, but pointed directly along it. The mean deflections obtained, the practice of the 4th September, 1862, Table IV., were as follows :—

	2° yds.	5° yds.	10° yds.
Service shot.....	·95 right	6·8 right	25·5 right.
Special shot (centre of gravity towards base) ..	1·2 left	1·2 left	71 right.
Special shot* (centre of gravity towards point)	2·3 left	1·4 left	18 left.

From the Report it may be observed that at 2° the deflections of the special shot were invariably to the *left* ; at 5° the mean deflection is also to the *left*. That all were not to the *left* at 5° and 10° arose most probably from the unsteadiness of some shot and the turning over of others during flight ; for the grazes of the shot which deflected to the right showed that the axis of the shot was considerably inclined to the line of the range. The unsteadiness during flight of the special shot at 5°

* 12th round omitted as elevating screw broke.

and 10°, which might have been inferred from the inaccuracy of the practice, was noticed both at the battery and on the range.

Now as the special shot were unsteady when fired even at 5°, in consequence of the gun not giving a sufficiently high velocity of rotation for flat-headed projectiles, I suggested that the remaining special shot should be fired at 2°, 3°, and 4°; this was done on the 9th and 18th April, 1864, and very decisive results were obtained. The following were the mean deflections obtained on the 9th April, Table V.;—

	2° yds.	3° yds.	4° yds.
Service shot...	·2 left	·2 left	line.
Special shot (centre of gravity towards point)	2·8 left	2·3 left	3 46 left.

The mean deflections on 18th April, Table VI., were,

	2° yds.	3° yds.	4° yds.
Service shot.....	1·6 left	1·4 right	1·9 right.
Special shot (centre of gravity towards base)	3·4 left	7·8 left	8·46 left.

On both days the wind blew from right to left and will account for some of the service shot having a slight deflection to the left; every one who has seen much practice is aware that the right deflection of the service shot is hardly sensible at low angles of elevation, and that a little wind blowing from right to left is sufficient to counteract it.

I have purposely omitted to notice No. 1 round with service shot, Table VI., for the deflection 8 yds. left, is evidently a very wild one, there being no such eccentric graze (at 2°) recorded in any of the practice returns given in Tables III., IV., V. and VI., or in numerous other practice returns I have purposely consulted.

On the 9th April, Table V., it was noticed that at 2° the special shot were steady during flight; at 3° they were unsteady near the end of the range; and at 4° they were unsteady for some distance before grazing. As might have been supposed the left deflections of the special shot with preponderance behind were greater than those of the special shot with preponderance in front.

The results of the experiments shown in the preceding Tables are, I conceive, sufficient to establish the following facts:—

(1) That elongated projectiles with rounded or pointed heads, have a tendency to deflect to the *right* at ordinary ranges when fired with *right-handed* rotation.

(2) That similar projectiles fired with *left-handed* rotation, tend to deflect to the *left*. (Table II.)

(3) That the *drift* of cylindrical or flat-headed projectiles is in the opposite direction to that of projectiles with rounded or pointed heads fired with similar rotation; for instance; if a cylindro-conoidal and a flat-headed shot be both fired with *right-handed* rotation, the *drift* of the former will tend to the right and the latter to the *left*.

(4) That the *drift* of ordinary service shot fired from the 40-pr. Armstrong gun is hardly sensible at 1000 yds.; for it may be seen from Tables V. and VI. that a slight breeze from left to right was sufficient to counteract the tendency of the shot to bear off to the right. It also appears from the Tables that flat-headed shot require a very much higher velocity of rotation than cylindro-conoidal projectiles, and that the former lose their velocity very much sooner than the latter.

The twist of the rifling in the 32-pr. gun, rifled on the Whitworth system, and with the intention of firing flat-headed shot, as being supposed more effective for penetration of iron plates than pointed shot, was much sharper than that of the 40-pr. Armstrong gun used for my own experiments; the left deflections given by the former were considerable and uniformly to the left (page 226). I was, however, only too glad to take the gun offered me, as there were no service guns then with a sharper twist.

It is evident that the drift to the left of flat-headed shot fired with right-handed rotation proved conclusively that the cause assigned by Professor Magnus for the drift of projectiles, fired from rifled guns with high velocities is at least the chief cause, the so called rolling effect not being sufficient to counteract this left deflection.

I will now give particulars of the attempt made to discredit the explanation of the cause of the *drift* given by Professor Magnus, and of the results of experiments described above, confirming it with respect to the deflection of flat-headed shot.

On the 16th April, 1873, the following paragraph appeared in the *Pall Mall Gazette*:—"But Colonel Owen, in 'Modern Artillery,' states that flat-headed shot, under similar conditions, deviate in the opposite direction—that is, to the left. Though this theory has apparently been proved to be mathematically correct by Professor Bashforth, in his treatise 'On the Motion of Projectiles,' still it has not been generally accepted by artillerists; and to test it, some flat-headed projectiles have been fired from the ten-inch howitzer. This piece was chosen on account of the very rapid twist of its rifling, and consequently great deviation of its projectiles; and it is found that all shot, whether flat or round-headed, deviate in the direction of their rotation."

Upon this paragraph I remarked* :—"Why Professor Bashforth should be thus dragged in, considering he has made no special study of the subject, and merely makes a few remarks on what others have done is not very apparent."

Had the writer read the remarks on the subject in "Modern Artillery," or in Professor Magnus' own work, he would have known that the theory was due to Professor Magnus, not Professor Bashforth; and its practical confirmation to my own experiments, and that with the Whitworth gun, obtained from the records of older experiments.†

With regard to the experiments with the 10-inch howitzer, I remarked‡ :—"Against these forty or fifty rounds fired with great care, so as to obtain trustworthy results, the correspondent's 'all shot, whether flat or round-headed,' only include three flat-headed shot, and these were fired with a very small charge (about one-fortieth), and therefore experienced a comparatively low resistance; and at an angle of forty degrees of elevation, giving very long time of flight, and probably causing the resultant of the air's resistance to act on the body, below the head, which would thus give a deflection to the right."

I did not know at the time that the so called flat-headed shot were not true cylinders; the point was flattened, but the corners were rounded. I will, however, allude to this again after giving the next

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* Appendix V., "Modern Artillery."

† The writer of the article confessed to me that he had never heard of this with the Whitworth gun.

‡ Appendix V., "Modern Artillery."

experiment, which was made after I had remonstrated on the inconclusive character of that with the three incorrectly termed flat-headed shot, the detailed results of which were not published.

The following are the particulars of the experiment made on 1st August, 1873, at Shoeburyness, and this time, having notice, I attended. An 11-inch M.L.R. gun of 24-tons, 19-cwt., 2-qrs. was used. The projectiles called *service* were strengtened common shell, weighted with lead up to 535-lbs.; those termed *flat-headed* were proof shot of the same weight. The charge was 85-lbs. of pebble powder.

The rounds were fired in three series of six each; three of these six being *service*, and three *flat-headed*, fired alternately.

FIRST SERIES.

Round.	Elevation.	Nature of Projectile.	Range. yds.	Deflection. yds.	
1	6° by Quadrant	F.H.	3005	3·6	Right.
2		Service	3192	6·0	„
3	6°22′ by Tangent Scale.	F.H.	3025	5·0	„
4		Service	3216	6·0	„
5		F.H.	3030	11·0	„
6		Service	3223	6·4	„

SECOND SERIES.

7	4°26′ by Tangent Scale.	F.H.	2208	9·0	Right.
8		Service	2275	6·2	„
9		F.H.	2150	8·0	„
10		Service	2260	8·0	„
11		F.H.	2200	6·0	„
12		Service	2325	6·4	„

THIRD SERIES.

13	2°	F.H.	1310	3·0	Right.
14	2°22′ by Tangent Scale.	Service	1322	3·6	„
15		F.H.	1369	3·0	„
16		Service	1358	1·0	„
17		F.H.	1326	3·6	„
18		Service	1311	1·6	„

In looking at these results it is apparent that the deflections of both kinds of projectiles were to the right; but on examining the proof shot I found that they were after all not cylindrical, the point only being flattened, while the shoulders were rounded off, and the results being therefore of no value. This I pointed out in a letter to the Secretary of the Department of the Director of Artillery in the following words:—"The results of the practice with 11-inch proof cylinders and shell on the 1st August, 1873, at Shoeburyness, are in my opinion of no value whatever from the fact of the so called flat-headed cylinders being considerably rounded off in front (radius 1·45). I pointed this out to Colonel Fisher and Captain Jones, who said he attended for Major Maitland."

"The projectiles used in former experiments to test deflection were true cylinders, and I have always been careful to say *flat-headed* or *cylindrical*, and to give diagrams with such form (*see* 'Modern Artillery.') 'This rounding off which might at first sight appear unimportant is a vital point. By calculation, it may be found that by thus rounding off the 11-inch cylinder (reducing the diameter of the

flat-head to 8·1-inch) the area of the annular curved portion is greater than that of the flat portion of the front surface presented to the resistance of the air during flight. These proof cylinders should not be termed, as they are in the Report, *flat-headed*.' "

" Besides the mere amount of rounded surface which gives with right-handed twist a right deflection, the rounding off of the shoulder changes the action of the air on the shot, doubtless by facilitating its passage from the front, and this has been clearly pointed out by Professor Bashforth, who, quoting the results of experiments, says : 'The slight variation in the resistance to these latter forms lead to the conclusion that the amount of resistance offered by the air to the motion of elongated shot is little affected by the more or less pointed apex, but depends chiefly upon the form of the head near its junction with the cylindrical body of the shot.—(Bashforth's 'Motion of Projectiles,' p. 30). The gyroscope shows clearly the great effect of a pressure near the circumferance compared to one near the centre of the flat head."

I had already said in " Modern Artillery,"* " that, to lay down one rule for all cases of velocities, angles of elevation, different positions of centre of gravity, varying direction and strength of wind, with either flat-headed or pointed projectiles, is evidently impossible, and the writer has not attempted to do so."

" In the meantime, the writer is satisfied by what has already been done, that if a flat-headed projectile be fired with a high initial velocity, with its axis steady on leaving the bore, with a velocity of rotation sufficiently high to keep the axis steady, and at such an angle that the resultant of the resistance of the air will act upon the flat surface, the deflection with a right-handed rotation, will be to the *left*, according to the theory of Magnus, not Bashforth."

It will then I think be admitted by those capable of forming a sound opinion on the results of the experiments described, and the conclusions that have been drawn from them, that at the low angles of elevation and high velocities with which elongated projectiles are fired from ordnance and small arms, the chief cause of *drift* is the conical motion of the front of the shot due to the action of the resistance of the air to the forward motion of the projectile, and that the rolling effect has but small influence ; also that the drooping of the head of the shot is due to the same cause, and cannot be due in any way to the rolling effect.

When, however, a projectile is fired at a high angle of elevation with a small charge, and consequent low velocity and long time of flight, the circumstances are changed. The angle of descent in such cases is very great, while the resistance of the air to the forward motion of the shot becomes slight, and as it descends from a great height at a high angle, in certain cases nearly vertically, the density of the air becomes very great below the projectile, and the rolling effect, caused by the friction of its under surface on the condensed air resisting its descent, may have a very great effect on the *drift*, while the resistance opposed to the forward motion being slight, it produces little effect on the *drift* during the latter portion of the flight.

This was probably one reason why the three proof shot fired in the Royal Arsenal, with a very low charge, and at 40° of elevation (as before

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* Apendix V

stated) gave right deflections, although, as already explained, the form of the head of these shot, rounded at the shoulder, would, in any case, have given a tendency in the same direction.

Major-General J. S. Nicholson, R.A., when Commandant at Shoeburyness, in 1889, pointed out to me, that with low charges and long times of flight, the drift of shells from the 8 inch howitzer, increased out of all proportion to range and time ; assigning as the reason that this was owing—"to the greater friction on the lower surface of the projectile, due to the greater condensation of the atmosphere, from their rapidly increasing velocity of fall." Thus, with 7-lbs. charge :—

Range. yds.	Drift. yds.	Time of Flight. secs.	Angle of Elevation. deg. mins.
500	2·0 right	2·7	4 20
1000	10·0 „	5·7	9 20
1500	22·0 „	8·9	14 55
2000	40·0 „	12·9	22 25
2500	85·0 „	19·2	35 6

Lieut.-Colonel Bally, R.A., sent me some tables giving the results of recent practice at Shoeburyness* with shells fired from 6-in. B.L. Howitzers of 25 and 30 cwt., and from 9-in. M.L. guns at high angles and with small charges, which latter would give comparatively low velocities of rotation to the projectiles. (*See* Appendix II.)

In practice with the 6-in. Howitzers, using shells of about 119 lbs. weight and 27 inches in length, and charges of 12, 15, 18 and 19 ozs. of cordite powder, the shells appeared steady in flight at 43°, but at 51°, 57°, 65°, 68° and 70°, more or less unsteady, especially in the descending branch of the trajectory ; at 43°, 51° and 57°, the drifts were to the right, at the higher angles to the left. With charges of 13, 29 and 32 ozs. of cordite some of the shells at the higher angles drifted to the right. Some of the shells had a spiral motion during flight, due probably to the velocity of rotation being too low, like the gyrations of a top or gyroscope at the end of the spin. Some of the shells were found on the ground in a horizontal position, others were standing on their bases.

Twenty Palliser shot, weighing from 356½ to 362 lbs., length 27·33 inches, fired with a charge of 18¾ lbs., gave apparently regular results ; five rounds were fired at 30°, 45°, 60° and 70°, the ranges being longest at 45° and shortest at 70°, as might be expected, and the drift, which was always to the right, increased with the angle of elevation, as the time of flight was longer. Similar results were obtained with cast-steel common shells, weighing 359¾ lbs., length 32·85 inches, fired from the same gun with the same charge. Also with similar shells with a 12½ lbs. charge, except at 70°, when the drifts were small, two being to the left and three to the right ; the projectiles being probably unsteady at this angle towards the end of the range.

In other practice from the same gun, to ascertain if the shells fell point first with the 12½ lbs. charge at 60°, 65° and 70°, the drifts appear to have been to the right, but two of the shells, which were fused, were blind ; the shells appeared to be steady in ascent but erratic when descending, the base at first falling till the shell was nearly vertical, and afterwards assuming a more or less horizontal position, and finally slewing slowly end for end, as the report says, *i.e.*, "the projectile was

* I intended to allude to these tables in my lecture and make the remarks inserted here, but Major Abdy stopped me, thinking that they would be produced by another officer, which however was not done.

rotating round its shorter axis." Some fell flat on the ground and others struck on their shoulders with points slightly upwards to the left, or in other eccentric positions, so it is evident that with this charge the velocity of rotation was not sufficient to keep the shells even point first during flight, and those with percussion fuses would consequently be blind.

The muzzle velocities given to the 6-in. Howitzer shells with charges of cordite powder would have been about—

12 ozs.	447 feet.
13 „	465 „
32 „	765 „

Those of the 9-in. Palliser shot and cast-steel shell, with 18¾ lbs. charge of ordinary powder, were 568 and 611 feet respectively. The records of the velocities for the 12½ lbs. and 7½ lbs. charges are uncertain, the velocities not being high enough to break the wires properly. Although the velocities must be low with the 7½ lbs. charge, a number of shells having gas checks, fired at 20°, 30°, 40°, 50° and 60°, had all right deflections; in this case the velocity of rotation being low the resistance tending to upset the shot would be comparatively slight.

The left drift of certain shells at very high angles (those of 6-in. Howitzer and a few of the 9-in.) is probably caused by the resultant of the air's resistance acting below the centre of gravity of the shell in these cases; but as these shells were unsteady in the descending branch of the trajectory and turned over in various eccentric ways, it is clear that the velocity of rotation became too low to keep them point first. Lieut.-Colonel Bally informed me that, as a rule, if the shell falls base first the drift is to the left. This is a curious fact, but the falling base first is probably due to the circumstance that the base end of the shell is heavier than the head, and that it tends to drop after the velocity of rotation has ceased to keep the shell rotating steadily round its longer axis. I am also informed that a long shell will fall base first when a shorter Palliser shell, fired with a similar charge and at the same angle of elevation, will fall point first. Of course, the longer the projectile the higher is the velocity of rotation required to keep it point first.

It may be seen from the tables that the drifts at these very high angles did not increase in the high proportion, compared with the times of flight, that they did at the angles from 4° 20′ to 35°, with the 8-in. Howitzer given me by Major-General Nicholson.

One of my old brother officers, when holding a scientific appointment, wrote to me, saying: "That the question, I have endeavoured to explain, is a matter of no practical interest." I venture, however, to think that those, either of the military or naval services, who look upon gunnery as a science, and not a mere rude art to be practiced by "rule of thumb," will not consider the discussion of such questions a waste of time.

DISCUSSION.

THE CHAIRMAN—I think it might be interesting, gentlemen, if I supplement the results which the lecturer has given us by giving you a few of those obtained with very modern artillery up to date. I find, so far as I can make out with reference to Table I., that in 1861 with a 40-pr. R.B.L. gun the shot had a radius of head of about 1¼-in. diameter and was about 2½-in. calibre long, and the muzzle velocity was about 1,180

feet to the second. At the present time our velocities are much higher, that is to say the resistance of the air is much greater, and the heads are struck with a radius of 2-in. diameter and the whole shell is longer. It seems to me that all these changes tend to increase the drift; but is this the case? Take a gun of moderate velocity, the 4·7-in. quick-firing gun, with a projectile of 45 lbs., muzzle velocity 1,786·8, I find that at 2,284 yards, the nearest range that I can get to compare with Table I., the drift was 7·2 yards right only; the error in range 30·2 and the error in direction 0·4. Now let us take the most modern gun that we have, the 12-in. B.L., Mark VIII., shot 850 lbs., muzzle velocity 2,360 feet to the second, head 2-in. diameter. With an elevation of 2°, range 3,451 yards, the mean deflection is 10 yards to the right only, and with an elevation of 9° and a range of 10,705 yards the deflection is 20·6 to the right. It is therefore clear that the drift has diminished, not increased. Is this due to there being reduced time of flight? It can hardly be this altogether, because the 12-in. breech-loader at 10,000 yards had hardly more drift than the 40-pr. breech-loader at 2,890 yards. To my mind there is no doubt that the diminished drift is due to the greater steadiness of the projectiles of the present day; they start without wobbling and they keep steadier to the end, having greater velocity of rotation. This 12-in. gun is perhaps the most accurate shooting gun in the world. At 7,082 yards the error in range is only 6·3, and the error in direction 1·6; at 10,000 yards it is only 14 in range and 2·75 in direction; and when fired at a target at 2,000 yards the only three rounds fired at the same elevation went through the same hole. With reference to the position of projectiles during flight, there can be no doubt that projectiles moving with a high velocity strike point first, but with projectiles moving with a low velocity and fired at high angles of elevation there is some diversity of opinion. To my eye one of these projectiles, when coming towards you, has in the descending branch of the trajectory its point very much to the right, looking as if it would fall sideways; but as it nears the earth the point approaches nearer and nearer to the trajectory, and it strikes the ground point first. That it does strike the ground in this way is evident, as otherwise the direct action fuze would not act. From recent observations carefully made on our practice grounds it appears that up to 60° they come down point first, but over that they cannot be depended on to do so.

Major P. A. MacMahon, F.R.S., R.A.—Sir, I have been so long away from practical gunnery that it is with some hesitation that I respond to the invitation to take part in this discussion. There are many here who have had greater experience in observation of fire, and others who have made a special study of the theory, and I shall be glad to give way to them in a very few moments.

It seems to me that General Owen has made out a very good case for Professor Magnus. So far as I can ascertain Professor Magnus' theory has never been displaced; I cannot find anything before us which can possibly take its place. Professor Magnus considers that the greater portion of the drift arises from causes which he specifies; doubtless there are other causes of drift, but granting that the causes assigned by Professor Magnus are in some respects the chief ones, I think that Professor Magnus has made, many years ago now, the principal valuable contribution to the theory. He seems to have established that in the

case of an ogival-headed projectile the drift is to the right, and in the case of a flat-headed projectile to the left ; and it immediately suggests itself to the mind whether there may not be some intermediate form, something between the ogival head and the flat head, for which there will be no drift. The drift to the right or to the left appears to arise from the fact that the direction of the resultant resistance of the air has a certain property with reference to the centre of gravity of the shot. It meets the curved surface of the shot and the direction of the normal to the surface at that point passes in the one case above the centre of gravity and in the other case below ; and, presumably, if the shot were to have a hemispherical head and the centre of gravity were to coincide with its centre this Magnus effect would in part disappear.

This question seems to me to be merged in the very much larger question of the movement of the longer axis of the projectile. Drift is a very small portion of that question ; there are other points which are very interesting to artillerists which arise from the consideration of the accurate movement of the longer axis of the projectile. This movement of the longer axis is affected in a large measure by the elevation at which the shot is fired. That was shown very clearly recently at Lydd in high angle firing with low muzzle velocities, when at an angle of elevation of about 65° it seemed to be uncertain whether the projectile was coming down point first or base first. Surely it is a matter of very great importance to know how the projectile is coming down. Upon this depends the action, say, of a nose fuse ; if it comes down base first then the fuse is inoperative. It seems extraordinary that the facts connected with the movement of the axis of the shot should be so much in the form of conjecture. We hear that officers observe the shot when the shot is large and the velocity low ; they see the shot turn over or come down point first or base first, as the case may be. But surely anything that the eye can see a photographic plate can see better, and it seems extraordinary, considering the resources of modern photography, that so much should remain a matter of conjecture and should be dependent upon the very uncertain observations of spectators. (Hear, hear.)

General Owen remarked in his lecture with regard to the drooping of the point of the shot that the holes made in certain vertical targets were circular.

Major-General Owen—They were not vertical targets ; they were slightly inclined targets.

Major MacMahon—I do not think that the angle at which a projectile penetrates or commences to penetrate the plate ought to remain a matter of doubt. Professor Boys has shown a conical bullet in the act of passing through a glass plate ; he has made the projectile take its own photograph by setting off a spark from a Leyden jar. Some experiment of a similar kind would give very accurate information in regard to the exact angle that the projectile made with the plate at the instant that it commenced penetration. I feel certain that if the matter were put before an experimentalist like Professor Boys he would see no difficulty whatever, if the gun were a fairly accurate one and there were suitable conditions. I think, sir, it is very satisfactory that General Owen has re-awakened interest in this subject which has been dormant for so long, and I hope now that research will go on in order to find out accurately the movement of the longer axis of the projectile.

I have an entire disbelief in any study of this subject which in the main is not on experimental lines. So many factors enter into the case, and so many brilliant mathematical intellects have given their attention to the subject with very small result, that I am sure what we want to know principally are facts, and then you may trust the mathematicians to fit the theory to the facts. In the present state of science it seems almost incredible that so much should be a matter of conjecture. That is all I have to say. (Loud applause.)

MAJOR G. MACKINLAY, (late) R.A.—As the Text Book of Gunnery has been alluded to, I would mention that it is intended to be confined to that which can be proved by well-established facts. As it is a *text* book, speculations and mere theories are avoided as much as possible ; gyroscopic action (to which, I believe, drift is chiefly due) is explained at some length in a couple of pages (242-244).

The present occasion, however, is one when less guarded language is permissible and when any theory may be discussed.

I think the lecturer has most successfully proved from the results of actual experiment the fallacy of the old hasty generalization, that all projectiles drift in the direction in which they rotate ; as he has given good evidence that *some* flat-headed projectiles with right-handed rotation drift to the left. We must not however run away with the idea that *all* flat-headed projectiles will behave in the same manner ; the lecturer has himself indicated that the centre of resistance would probably act, even with flat-headed projectiles, on opposite sides of the centre of gravity with long and with short shells, thus causing corresponding drift to the right or to the left. Doubtless, also, many other circumstances influence the position of the centre of pressure of the resisting air, such as the distribution of the weight of shell, shape of its recis, roughness or smoothness of different parts of its surface, &c., &c.

The lecturer has pointed out that flat-headed projectiles are not well adapted for flight, as they require more rotation than pointed shells of about the same calibre and weight to keep them steady in their course ; as also the flat head offers an increased resistance to the air it is not likely that they will ever be used in the future, and the general question of the drift of flat-headed projectiles will probably not be decided by actual trial.

With regard to Colonel Bainbridge's interesting statement about the diminished drift of modern high-velocity projectiles, I notice in accordance with it that in the 8-in. Howitzer* fired with different charges the higher the muzzle velocity the less is always the drift, whether we compare equal ranges or equal times of flight. I should be inclined to attribute the diminished drift, under all these circumstances, to the higher velocity of rotation consequent on increased muzzle velocity.

In conclusion, I believe drift to be the result of a large number of causes, the principal being gyroscopic ; the others are very little known except by their combined result.

CAPTAIN J. H. MANSELL, R.A.—Sir, the lecturer has pointed out, as we have already been shown, what effect the gyroscopic action has on the ultimate drift of a projectile ; but there is one point that I am not at all clear about from what we have heard. The lecturer has told us that

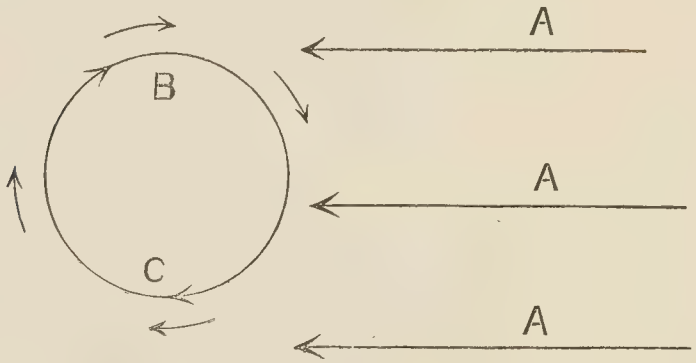
* *See* Range Table 8-in. R.M. Howitzer, p. 309 Text Book of Gunnery.

with a high angle of elevation and a very low velocity what he calls the rolling effect comes into play, and he said that this rolling effect tends to carry the projectile to the right in the descending branch. Is that so?

MAJOR-GENERAL OWEN—With a sufficient rotation.

CAPTAIN MANSELL—I cannot think that that is so at all. I think that at those critical periods the tendency is to a slip of the projectile to the left. Some experiments of Professor Magnus with spherical projectiles, which were published in the paper that the lecturer has referred to, completely bear out this point I think, and if I may I would just like to show what I mean.

Fig. 1.

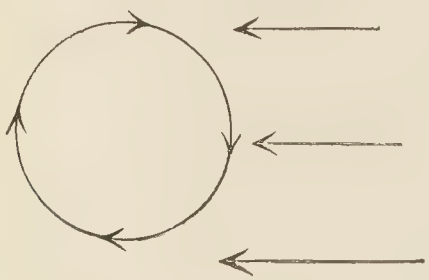


He took a cylindrical body and rotated it, and directed a blast of air upon it in a direction at right angles to its axis of revolution. Let Fig. 1 represent the conditions. It is evident that the body in its rotation carries the air round with it in the direction of its rotation. Now we see from the figure that at B the current of rotation is opposed to that of translation (A), while at C the current of rotation is with that of translation. It follows therefore that the resultant velocity of the air is less on the side B than it is on the side C. Under these conditions Professor Magnus shewed by a beautiful experiment that the lateral pressure of the air on the body is greater on that side where the velocity is least, viz., at B in Fig. 1. Magnus further shewed that when the velocity of the blast was great in comparison with the velocity of rotation the lateral pressure on the sides was not affected. This is easily understood; for if V is the velocity of the blast and it is directed on the body at rest the ratio of the velocity of the air on either side is $\frac{V}{V}=1$. Now if the body is rotated with a velocity v, the ratio of the velocities of the air, on either side, becomes $\frac{V+v}{V-v}$, and when V is very great in comparison with v this ratio remains approximately units, and therefore the lateral pressures on either side of the body remain equal. This explains why some change from the gyroscopic cause of drift is not noticed except at critical velocities, such as are experienced when firing with low muzzle velocities at high angles of elevation.

I am unable to reproduce Magnus' original experiment but if I may I will show you with a candle. If I blow a blast of air on the left hand side of this candle flame the velocity is greater on the left hand side

than it is on the right, and therefore the lateral pressure of the air on the right should be greater and the flame ought to deflect to the left, as I think you will see that it does. (Applause.) That is just a little illustration of Professor Magnus' point. How does that apply to a projectile descending from a great height with a very low velocity of translation ? This is a most important point, as the lecturer has told us with high angle fire recently an ultimate *left* drift of the projectile was noticed.

Fig. 2.



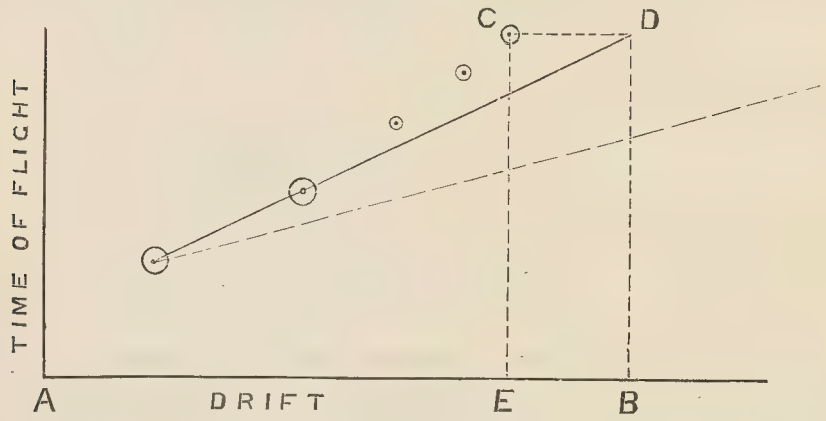
Now consider the projectile in the descending branch. Let Fig. 2 represent a section of it as seen from the gun, the resistance of the air acting upwards. On the right side the current of rotation is against the resistance of the air, while on the left it is with the resistance of the air. Consequently the resultant velocity of the air is lower on the right hand side and therefore the lateral pressure is greater, and therefore the tendency of the shot is to slip to the *left* in the descending branch when the velocity of translation is low. Now that is all theory, and as Major MacMahon has said it is desirable that we should have practical results. I will therefore take the lecturer's own table of the 8-in. Howitzer. He points to that and says that with a time of flight of 2·7 seconds there is a drift to the right of two yards, and with a time of flight of 19·2 seconds there is a drift of 85 yards, which is very large in proportion, and he takes a simple multiple for the comparison. But there is nothing to show that we should take a simple multiple in the connection between the time of flight and the drift. I have looked into the subject roughly and I have found that with all high-velocity guns of the present day the relation between time of flight and drift is expressed in a very simple form with every gun that I have been able to get out. When the shot is projected at a high velocity and low angle of elevation it is a matter of agreement, neither rolling effect nor slip affect the question of drift. In fact the gyroscopic effect determines drift. Under these conditions I find the relation between time of flight and drift is expressed by the equation—

$$T = K \times (D)\ n,$$

where T is time of flight in secs. and D is drift in yards, K and n being constants for the particular gun. Now the points given by the above equation, if plotted on a logarithmic chart, lie on a straight line, and can be easily studied when thus graphically expressed. Taking the Range table for the 8-in. Howitzer, firing 10 lbs. R.L. gunpowder, I find that up to an elevation of 5° 20′ the points so plotted lie absolutely on

a straight line. This shows that the law holds in the 8-in. Howitzer when the velocity is sufficient to the end of the range to render any cause of drift, except the gyroscopic, inoperative.

Taking the Range table the lecturer has given us, and plotting the first two points on a logarithmic chart, if we join these points and produce the line we have our curve of expectation. If the rolling effect is to the right the actual points found by practice should lie to the right of this curve. On the contrary I find every other point lies to the left. What does this mean? It means (see rough chart) that at the



time of flight (B D secs.) instead of having a drift to the right of (A B yards) we have only (A E yards), which is less than what we would expect from gyroscopic considerations by (C D yards). The curve of expectation from the first two rounds in the lecturer's Range table shows a right drift at 2,500 yards of 135 yards, whereas the Range table only gives 85 yards, or a slip to the left of 40 per cent. And even this is under the mark as the true curve lies somewhat below, as shewn in dotted lines.

It seems to me therefore that projectiles must slip to the left in the descending branch and that the evidence is for that. I should like the point cleared up by someone who knows more about it than I do; there are many eminent men here to-night and I rather regret that I have joined in the discussion at all; but anyhow I hope one of the theories will die to-night, either rolling to the right or slip to the left.

PROFESSOR A. G. GREENHILL, F.R.S.—Sir, I hope I may be permitted to express my opinion that General Owen has performed a very valuable service to the science of artillery by bringing forward this baffling question of drift, which has lately been allowed to slumber. His own treatise on "Modern Artillery," and the paper we have before us contain very valuable references to the writings of continental artillerists on the question; and I have recently had occasion to go through these memoirs; but although they bristle with long mathematical formulas I have come to the same conclusion as Major MacMahon, that they leave us very much where we were before. I say this in spite of the opinion of a distinguished authority, a French officer, Colonel Astier, who, writing in 1873, about the same time as General Owen was writing his treatise on Artillery, says in his "*Essai sur le mouvement des projectiles*

oblongs," of 1873, "*Les explications qu'on a tenté d'en donner (du phénomène qu'on n'avait pas prévu, la dérivation) longtemps controversées sont aujoud'hui acquises à la science, et il n'est pas permis aux hommes du métier de les ignorer.*" Captain Cooper has designed an apparatus which is before us on the table, and he has kindly promised to shew it in action at the end of the proceedings. The spinning projectile is here represented by a gyrostal enclosed in a box on wheels, running backwards and forwards on the track representing a switch-back road, which guides the truck in a sort of inverted trajectory. When the gyrostal is not spinning the truck runs backwards and forwards as usual, but when we spin the gyrostal it swerves to one side or the other according as it is moving on the concave or the convex portion of the track. On the short straight part at the outset there is no deviation. We invite the company present to frame their theories *a priori* as to the direction which the truck will take, and then we can put their theories to the test of experiment. However, the swerving effect being due to the curvature of the trajectory, it seems that it is this curvature which has an important influence on the drift, as is noticeable especially in high angle fire. I hope we shall have the benefit of the expression of his opinions from the Professor of Artillery, Major Curteis, whom I see in the room. We are engaged at present in bringing out a new edition of Major Mackinlay's "Text Book of Gunnery," so that General Owen's paper is very opportune for us ; but in spite of the unfavourable opinion of General Owen of the brevity of the treatment of the subject by Major Mackinlay, I must confess that we are tempted to adhere to the treatment that is given by Major Mackinlay, for fear of being led too deep into a subject in which uncertainty seems still to reign to so great an extent. (Applause.)

Captain Maurice B. Lloyd, R.A.—There are one or two points, sir, that struck me whilst considering the lecturer's demonstrations, particularly in the first part of his mathematical treatment of it. One was why he should take the resistance of the air as acting midway between the two lines bounding the surface swept out. This surely would not be the case with an ogival projectile, though it may be so with the flat-headed projectile ; but in any case the theory upon which that resistance is taken is rather an exploded theory I think nowadays, as it only allows for the impact of the shell against the particles of air in front of it.* Now there is a very large force produced by the suction of the air upon the base of the shell, which was shewn by Professor Boys' photographs of bullets in motion, where the wake of the bullet is marked by almost as strong a line as the bow wave, if I may so call it, of the compression of the air ; but that force has not been taken into consideration at all in General Owen's treatment of the matter. Of course it is very difficult indeed to allow for a force of that sort which you have no means of measuring.

Again, there is one point that I should like to draw attention to and that is about a golf ball. A golf ball exhibits the most extraordinary drift. (Laughter.) Everyone knows when you slice a golf ball it will go to the right, whereas if you toe it, it will go to the left. In either case this cannot be due to gyrostatic action because the golf ball is a sphere, and a sphere gives no gyrostatic action under any circumstances.

* Taking this view of the resistance of the air assumes it to vary as the square of the velocity which is only true between certain restricted limits.

So that in the golf ball, at all events, the drift must be owing to the cushioning. I feel that I am rather in a minority of one in taking that opinion ; everybody seems to be adhering to the gyrostatic action, but I think myself that the cushioning must, in some cases at all events, have a certain amount of effect.

CAPTAIN E. S. COOPER, R.A., then exhibited the apparatus that he had made to show the result of gyrostatic action.

REPLY.

MAJOR-GENERAL OWEN—I think what Colonel Bainbridge said with regard to drift may be accounted for very likely by his explanation, which I think is accurate, namely that the projectiles have now much higher velocity of rotation and move more steadily, and therefore the drift is not so wide.

Major MacMahon's suggestion as to photography of the shot is certainly, I think, an excellent one. A photograph of a bullet passing through a plate is the most wonderful thing, and was shown here I think some short time ago. I allude to the action of photography in showing the currents of air round the shot, which you cannot see with your eyes, and I do not see why you should not get some very good results by taking photographs of a shot at different points in the trajectory.

Both Major MacMahon and Major Mackinlay said that after all everything depends on facts. I quite agree as to that. The facts that I have given you speak for themselves ; if they are not sufficient then you must judge of that ; but so far as regards the last table, that General Nicholson gave me, showing the extraordinary increase of drift at these higher angles, I do not profess to offer any particular opinion. I merely state the fact here that the drift increases in a much higher proportion than the time of flight. I have not gone into the reasons for this proportion of the time of flight to the drift, beyond suggesting that the rolling effect may be considerable. What Captain Mansell has said may perhaps offer an explanation of the extraordinary fact of the left deflection of some projectiles fired at high angles which fall base first ; but if a shot falls base first whether it deflects to the right or to the left is not of much consequence, because it is a useless projectile with a percussion fuse. No shells should be fired at high angles unless they have a sufficient rotation to keep them steady in flight ; it is no use trusting to wild results, no matter in which direction they fall.

I will only say about a golf ball that, like a billiard ball or anything else of the kind, if you hit it in a certain direction you give it a certain rotation ; it will not twist one way or the other unless it has a rotation. It will not drift without having a particular motion one way.

I will not detain you longer, gentlemen. I am very much obliged to you all for listening so attentively to me, although the subject is such an old one. I shall be very glad if it leads to any useful result so far as regards the future of artillery practice.* (Applause.)

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* NOTE.—The Rev. F. Bashforth, formerly Professor of Applied Mathematics to the Advanced Class of Royal Artillery Officers at Woolwich, and one of the highest authorities on scientific questions relating to the motions of projectiles from guns, in writing to me after this lecture, says : "I do not see what there is to object against the explanation of Magnus. It seems to me to be simple and complete, and well illustrated by the gyroscope. I always adopt the theory, and speak of it as a thing settled."

THE CHAIRMAN—It only remains for me to thank the lecturer very much for his interesting lecture, which has led to such a very interesting discussion. I am afraid we are not unanimous as to drift yet.

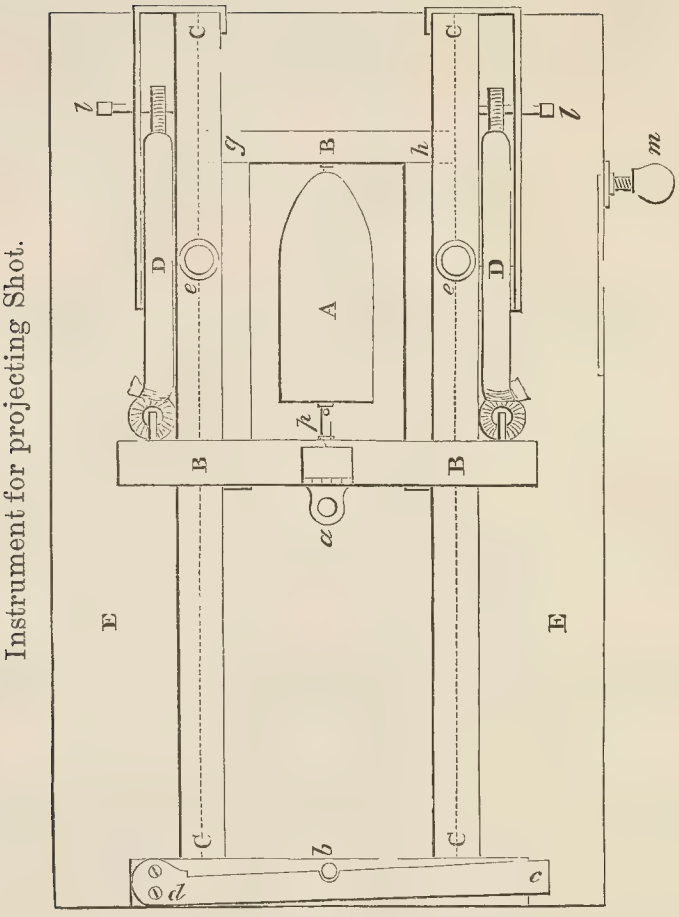
APPENDIX I.

INSTRUMENT FOR SHOWING THE MOTION OF AN ELONGATED SHOT DURING FLIGHT.

The diagram on the next page represents the plan of an instrument made for me, by Mr. Colbrook, modeller of the R.M. Academy, Woolwich, to show the motion of an elongated shot when projected with or without rotation at a low velocity. The shot *A*, is made of box-wood, and is about 5 inches long and 2 inches in diameter ; it is supported in two metal centres in the axis of a movable frame, *B B B*, which can slide up or down in the grooves, shown by the dotted lines, in the side pieces *C C*. The side pieces are attached to a table, *E E*, which can be raised and fixed at any required angle of elevation to another lower table by means of the screw *m*.

To project the shot, the frame is drawn down until the metal eye *a* can be placed over the pin *b*, two gutta percha springs, *D D*, being very much stretched to allow of this. As may be seen in the diagram, one end of each spring is attached to the hind cross piece of the frame, and the other end to a pin, *l*, fitting into a hole in the side piece. *c d* is a metal spring, and when the end *c* is raised, the eye is suddenly lifted off the pin, the frame is released and moves rapidly up the side pieces until checked by the wooden pins *e e*, which have a gutta percha wad over each to lesson the strain upon them. The front cross piece of the frame, *g h*, is not attached to the rest of it, but flies off when the motion of the frame is checked, the shot being therefore free to move forwards.

The velocity being low, the exact position of the axis may be easily observed. The range may be varied, as with a gun, by elevating the table, or by changing the position of the pins *l l* so as to increase or decrease the tension of the springs when the frame is drawn down. The greatest range at 45° is about 30 to 35 feet.



When the shot is projected without rotation, it turns over in flight, thus showing the impracticability of obtaining favourable results by firing elongated projectiles from pieces which do not give rotatory motion.

The shot *A* can be made to rotate with different degrees of velocity by pulling a thin silken cord wound round the hind centre *p*. If a *slow* rotatory motion be imparted to the shot, and it is then projected, it will proceed point first with a *wabling* motion ; but if the projectile be given a *rapid* rotation, the axis will be stable during flight, and remain parallel to its primary direction.

Pointed and flat-headed shot of paper were also employed, and being so much lighter than those of wood the effects of the air's resistance upon them were more evident.

APPENDIX II.

6-in. B.L. Howitzer, 25 cwts.—Projectile : C.S. common shell, weight 118 lbs., length 27 ins. Fuse : D.A., Mark II.

Charge : 12 oz. (cordite)—

Round.	Elevation.	Range. yds.	Deviation. Left, yds.	Right, yds.
1	43°	1,659	...	65·8
2	68°	1,074	162·6	...
3	70°	1,122	191·4	...
4	69° 38′	1,092	169·0	...
8	43°	1,753	...	65·4
	Charge : 15 oz. (cordite)—			
5	69° 35′	1,342	237·0	...
6	,,	1,370	261·0	...
7	,,	1,393	272·2	...
	Charge : 12 oz. (cordite)—			
9	57°	1,596	...	95·0
10	,,	1,523	...	99·0
11	51°	1,739	...	94·6
12	,,	1,746	...	101·6

All the shell fired at 70° (about) were found standing on their bases and the fuses unfired. They all drifted to the left. This seems to verify the idea that the direction of the drift may be taken as a guide regarding how the projectile falls.

Behaviour during Flight, &c.

Round 1, elevation 43°—Steady throughout and fell point foremost. Not recovered.

Round 2, elevation 68°—Slightly unsteady at starting, turned broadside on at top of trajectory, and drifted a long way to the left. Not recovered.

Round 3, elevation 70°—Steady at starting; lost in clouds. Not recovered.

Round 4, elevation 69° 38′—Rose steady, began to descend base first; then appeared to get horizontal, drifted rapidly left, and fell one end foremost. Found standing (9 ft. deep in ground) on its base at an angle of about 65° to vertical.

Round 8, elevation 43°—Steady and point first. Not recovered.

Round 9, elevation 57°—Correct up to top of trajectory; after beginning to fall appeared horizontal and wavering. Turned vertical about 150 ft. from ground, could not see whether point or base lowest. Found 5½ ft. underground, nearly horizontal, point 40° to left front and slightly lowest. The shell had travelled 9 ft. underground.

Round 10, elevation 57°—Similar to round 9 as regards flight. It travelled 9 ft. underground, found 5 ft. below surface standing on its base, no indication of shell having turned over.

Round 11, elevation 51°—Correct all the way but point seemed to waver from side to side. Shell travelled 14 ft. under mud; found $8\frac{1}{2}$ ft. below surface, nearly horizontal, base to front and slightly inclined to left and downwards. No indication of having turned over after striking.

Round 12, elevation 51°—Fell with point slightly to right till near ground, then got vertical. Shell had travelled 11 ft. under the mud. Found 6 ft. below surface, base lowest and to the left. No indication of having turned over after striking.

6-in. B.L. Howitzer (25 cwt.)—Projectile : $119\frac{1}{2}$ lbs. weight, 27 in. length.

33 oz. charge (cordite).

Elevation.	Flight. secs.	Range. yds.	Deviation. Left.	Deviation. Right.
43°	N.O.	5,206	...	168·4
...	32·0	5,158	...	168·4
70°	N.O.	3,308	...	73·4
...	46·79	3,349	10·8	...
...	46·43	3,309	...	56·6

12 oz. charge (cordite).

43°	18·51	1,780	...	67·6
...	18·71	1,819	...	62·4
70°	N.O.	1,101	195·6	...
65°	26·16	1,448	11·4	...
...	25·80	1,427	3·4	...

9-in. R.M.L., Mark VI.—Charge : $18\frac{3}{4}$ lbs. Pointed-head projectile : Cast steel C.S., weight $359\frac{3}{4}$ lbs., length 32·85 ins. M.V., 611 f.s.

Elevation.	Time of Flight. secs.	Range. yds.	Deviation. Right, yds.	Wind.
70°	N.O.	2,103	231·6	
...	N.O.	2,135	224·6	Force about 2.
...	36·51	2,132	220·8	
...	36·23	2,115	214·6	
...	36·9	2,170	220·8	
60°	32·65	3,037	172·6	
...	N.O.	3,057	170·6	
...	32·9	3,090	172·2	
...	32·91	3,079	175·0	
...	32·67	3,045	170·8	
30°	18·96	3,129	51·2	
...	19·16	3,149	52·6	
...	18·96	3,117	49·0	
...	19·24	3,198	48·8	
...	19·16	3,170	50·4	
45°	26·59	3,551	108·4	
...	26·62	3,549	109·8	
...	26·25	3,439	102·8	
...	26·71	3,572	104·4	
...	26·66	3,564	105·4	

9-in. R.M.L., Mark VI.—Charge: 18¾ lbs. Palliser shot: weight, 356½ lbs. to 362 lbs.; length, 27·33 ins.; ogival head. M.V., 568 f.s.

Elevation.	Time of Flight. secs.	Range. yds.	Deviation. Right, yds.	Wind.
30°	17·22	2,639	35·4	
...	16·91	2,557	34·4	Force.
...	17·54	2,723	36·6	
...	17·31	2,667	37·2	2 to 0 | 3 to 0
...	17·35	2,680	37·6	
45°	25·23	3,211	92·6	
...	24·87	3,118	88·6	
...	25·31	3,226	86·8	
...	25·34	3,247	92·2	
...	25·26	3,224	95·2	
60°	30·69	2,742	146·0	
...	30·26	2,687	141·6	
...	30·88	2,789	147·4	
...	28·67	2,373	123·8	
...	30 98	2,795	143·2	
70°	32·87	1,811	185·4	
...	32·95	1,828	186·0	
...	33·30	1,847	184·6	
...	32·82	1,809	178·0	
...	32·64	1,778	171·2	

A VISIT TO PERSIA.

BY

MAJOR J. F. MANIFOLD, R.A.

HAVING recently returned from a visit to Persia, I have put together a few facts connected with its present military condition which may be of some small interest.

The Persian army may be divided into two classes, the regular and the irregular forces; the former class comprise all three arms, infantry, cavalry and artillery, organized and trained to a certain extent on the model of European armies, while the latter consists of tribal levies of infantry and cavalry. From a military point of view the people of Persia may be considered to consist of two main groups, the Persian speaking people, who form the larger proportion of the population, and those of Turkish origin who are to be found for the most part in Azerbaijan and the north-west portions of the country. The latter are the direct descendants of the Turks, who many centuries ago over ran all Western Asia and who are consequently of the same stock as the Turk of Europe of the present day, the language differing but slightly. These Turks are considered to produce the best military material in the country and the martial instincts and traditions which they inherit from their Turkish ancestors are of a high order and such as have given them a reputation for fighting qualities which they have long upheld. In the matter of their physique nothing more could be desired, a more powerful or hardier set of men are not to be found elsewhere, and a comparison of physique between the Persian and Russian soldier is decidedly in favour of the former.

The regular army may be put at 25,000 men, though on paper it is probably shewn at more than double that number, but in Persia accuracy is not considered an essential virtue and but little reliance can be placed on official returns, especially where the dignity and importance of the State demand that numbers should be made to appear as large as possible. From the number of regiments to be seen in Tehran one may compute the garrison of regular troops in the city to be not under 4,000 men, the greater portion of which may be seen daily at drill on the large parade ground, which at the hour of morning parade is one of the most interesting sights in Tehran.

The garrison parade ground of the capital of Persia is a noble specimen of its kind; it is a square with sides about five hundred yards long and enclosed by high walls which are ornamented in an artistic manner by a number of alcoves or recesses. The square is entered by several gates, the main gateway has an effective appearance and it is

adorned with designs representing soldiers of the various branches of the army.

Most of the time spent by the infantry on parade is taken up with ceremonial exercises; marching past is rehearsed daily, while the manual exercise and any form of drills, likely to make an effective show, are practised continually. But drills even of this nature are executed in a slack and slovenly manner and it is not unusual to see some of the rear rank, during the manual exercise, taking advantage of their somewhat concealed position, to re-adjust an uncomfortable shoe or to arrange some part of their uniform.

Even in Tehran the soldiers are very baldly clothed, so one may conclude that, in the more remote garrisons, the uniforms are in much worse condition; little attempt is made to fit the clothing and the material from which it is made is of very inferior quality. As to the officers they do not appear in the matter of general smartness to be in any way superior to the men, nor of a type likely to do much towards elevating the army at large. Their words of command are generally accompanied by much manual demonstration and flourishing of swords, but mere words of command do not appear to have much effect in quickening the movements of the men to enliven whose paces much stronger forms of argument are frequently resorted to.

The Persians are proud of their artillery, the small increase of pay given to that arm securing a fine set of men—both gunners and drivers receive the same pay. Field batteries are to be seen at drill every morning on the garrison parade ground, their movements seem to be limited to driving round in column of route or with an occasional variation to column of sections; any rapid or more extended movements would, in the crowded state of the parade ground, be attended with much danger to the other arms. The horses are the ordinary horses of Persia, mere ponies when judged by an English standard, they are well fed and in good condition and, like all the horses of Persia, are very hardy and possess great powers of endurance.

Pole draught is entirely used while the old Bengal Artillery pole and harness, still in use with a few batteries, shews that the first training of the artillery was carried out under Bengal Artillery officers. The harness generally in use is a copy from the Austrian Artillery, but little attempt is made to fit it to the horses and the whole turn-out is untidy, shewing a great absence of care or supervision on the part of the officers.

The uniform of the artillery is a dark-coloured blouse, almost black, of common serge with light blue collar, pantaloons of a blueish shade with red stripe. The head-dress is a sheep-skin of the usual national type with a brass badge in front, both gunners and drivers wear jack boots of an English pattern, generally of enormous dimensions round the calf.

There are two cavalry regiments in Tehran which are equipped and turned out so as to resemble as closely as possible Cossack Cavalry. These two regiments form by far the smartest portion of the Persian army, due of course to their being under the direct control of Russian officers. There are at present three Russian officers and six Russian

non-commissioned officers in charge of these two regiments, in the control of which they have been given a much freer hand than has been heretofore given to foreign officers. The Russians have had much experience in dealing with orientals of every nationality and they know how much their own prestige gains through being in charge of a well managed concern, but more especially where that is a military organization. The importance of having the control of pay and promotion cannot be over-rated, for in other branches of the Persian army much of the soldier's pay is embezzled, while promotion is sold to the highest bidder. These two Cossack regiments receive better pay than the rest of the cavalry and, what is more to the point, they receive it in full. They are, therefore, well satisfied with their condition and are envied and looked up to by the rest of the army and the outside public in general, matters which have much to do with sustaining the prestige and reputation of Russia with the army.

Each of these two regiments consists of three squadrons, with a full proportion of Persian officers, but all matters of general organization and instruction lie completely in the hands of the Russian officers. The uniform is a long frock-coat with flowing skirts, with cartridge pockets attached to each side of the breast, long boots and a low cut sheep-skin cap, with a badge in front; the dress is picturesque and the frock-coat a most serviceable garment. In the matter of saddlery the ring bit has been replaced by a simple bridoon, but the high Cossack saddle with its cushion-like seat is not an improvement on the ordinary saddle of Persia, where if practice and long use are to be taken as a guide, the fitting of both riding and pack saddles should be understood better than in any country in the world and the Persian recruit must find it a strange experience to be put through a course of riding on a saddle so totally different to what he has been accustomed to in his own home.

The main Arsenal of Persia, the great source of supply to the regular and irregular forces of Persia, is situated in the centre of the city of Tehran, close to the principal State buildings which comprise the Shah's Palace, the Council House and the various Government offices. The manufacture of material of every description is here carried on, but in almost every case are stores of native pattern being now set aside in favour of patterns recently introduced by the various foreign officers who have been employed with the army. In some cases the European patterns are by no means so suitable to the ways of the country as are those of native pattern, this is certainly the case in the matter of saddlery where the Persian has but little to learn from Europeans.

The Laboratory Department manufactures most of the cartridges required for the army, the machinery for which has been purchased in England. Cartridges of many descriptions are required for the multiplicity of arms in use. The majority of cartridges required are of the Werndl pattern, this being the rifle with which the infantry are for the most part armed. The number of hands employed appears small, but working at pressure from 20,000 to 30,000 cartridges can be turned out daily. The cartridges, solid drawn, are well made.

Percussion caps and many kinds of stores of obsolete pattern are manufactured for the irregular army, while the various natures of guns in use with the Field Artillery require many different types of stores. Thus for the Uchatius guns built on the Austrian model, friction tubes such as are used in Austria are required, while for the guns introduced by the Russian officers, a Russian pattern tube is required; the complication and trouble that this leads to may be well imagined.

The work done in the Gun Factory appears to be the best carried out in the Arsenal. The guns at present under construction are being copied from those purchased in Austria, they are made of a composition of bronze resembling Uchatius metal. The machinery used for rifling is of a somewhat primative nature. A complete battery of six mountain guns, constructed in the Arsenal, on the pattern of the Austrian mountain gun were extremely well turned out. The gun carriages now being made for Field and Mountain Artillery are of wrought iron of the Austrian pattern; in fact the artillery armament may now be taken as altogether on the Austrian model, these patterns having been introduced by the Austrian officers who entered the service of the Shah after his visit to Vienna in 1878.

The Arsenal also includes a harness factory, the leather for which is tanned and prepared at Hamádan. Here again the harness is copied from the Austrian, the Bengal pattern harness once in use being now discarded. The harness factory, besides turning out saddlery for the artillery and cavalry also devotes itself to the manufacture of harness for the Royal equipages and several most gorgeous sets of harness for use on State and high ceremonial occasions are exhibited in the pattern room with much pride. The patent leather used for this harness is of foreign manufacture, having been, like many other articles seen in Persia, made in Russia. A complete change of saddlery is being now effected throughout the Persian army, the Austrian pattern saddle having been recently adopted for all the regular cavalry, except the Cossack cavalry, so that the harness factory is at present particularly busy.

In the Arsenal are kept the various natures of material required for immediate issue, not only in the matter of ammunition and the more important articles such as rifles, bayonets, swords, but also all the smaller articles of equipment. All articles are put away neatly, but there is such an intermingling of different natures of equipment that to make an issue on any large scale would lead to endless confusion.

The main supply of reserve material and stores is kept in a large magazine on the outskirts of the city. The number of guns, rifles and articles of equipment kept in store as a reserve far exceeds what one would expect to find in Persia, where, in the matter of prudential arrangements, but little trouble is taken by the administration. Guns, carriages and stores for one field battery complete are kept in reserve. The guns for this battery are those of ten centimetres, such as are in use with the Austrian Artillery. The ammunition wagons are not with the guns, so their existence may be looked on as rather doubtful.

There is also in the reserve store a battery of six mountain guns of the Austrian pattern with the necessary saddlery and equipment, these guns, also those for the Field Artillery, were purchased in Austria; the guns and stores are in good order and shew that much care is expended on them. The most modern form of artillery to be seen in the reserve store is a battery of four Maxim-Nordenfeldt guns, purchased last year in England. The storemen in charge of these guns are thoroughly conversant with the manipulation of the somewhat complicated breech action and fittings; none of these guns have as yet been issued to the army, so the number of men who understand their working is limited. There is a very decided tendency on the part of the Persian War Office to order from abroad, guns, ammunition and military stores of a modern type which are intended to be kept in store more for the sake of display than for every day use. This is particularly the case in the matter of the more modern small-arms, large numbers of which are in store, while some of the regular infantry and most of the irregular levies are still armed with the brown Bess.

The reserve of small-arms is considerable, but it is composed of a very mixed assortment of weapons. Austrian arms have been largely purchased and there are now 50,000 Werndl rifles in reserve. The Werndl may be considered as the breech-loading rifle in general use with the regular infantry, a very small portion being still armed with muzzle-loaders, although the greater part of the irregular levies are still thus armed.

There are also in reserve 5,000 Mannlicher repeating rifles, lately purchased in Austria, but no issue of them whatever has as yet been made nor have any of the infantry been trained to their use. For all practical purposes these rifles may be considered as forming the ornamental part of the armament of the army, over the purchase of which a certain amount of profit has undoubtedly found its way into the pockets of the officials who arranged for the supply. These rifles help to make a show on the occasion of Royal visits or when foreigners are permitted to inspect the Arsenal. They afford a chance of demonstrating the progress that is being made in the Persian Army, but practically the Mannlichers may be consideed useless, as none of the troops have been trained to their use.

In the reserve stores are 5,000 Berdan carbines, the weapon with which the cavalry are now armed. The introduction of this rifle is, of course, due to the influence of the Russian officers who have charge of the Cossack modelled regiments. There are also a considerable number of Winchester repeating carbines, intended for the cavalry, which, with the addition of 5,000 Martini rifles, purchased from the Springfield Small-Arms Company, complete the reserve supply of modern small-arms.

The ammunition in reserve for the above is said to be ample, but in such matters it would not be wise to take for granted everything which one hears. The difficulty and confusion which must arise in the issue of such a mixed assortment of ammunition as would be required by troops in the field is too apparent. This complication is particularly

marked in the matter of artillery stores; friction tubes of a different pattern are required for each of the various natures of field-guns in the service. Thus the Horse Artillery battery attached to the Cossack cavalry regiments require one nature of tube for their guns which were purchased in Russia, while the Field Artillery, armed with the Austrian Uchatius gun require another description and the batteries armed with the early issue of rifled guns require a third. Simplicity and similarity of arms and equipment has been far from the minds of those who control the supply of the Persian army.

The amount of uniform in reserve is considerable and shews much more thoroughness of detail in the arrangements of the clothing department than is to be seen in other departments in Persia. There is stated to be a reserve issue of clothing for 80,000 men, allowing one winter and one summer suit for each man, also the necessary pouches, belts, water bottles and other articles of smaller equipment, as well as camp cooking utensils. Supplies of this nature may be taken as sufficient to satisfy the immediate wants of the army should it be called on to take the field.

Looking at the military geography of Persia we see that Russia, in her relations to that country, occupies a position which, day by day, increases in importance. On the north and north-east she has been for years co-terminous with Persia, while her military position is being steadily strengthened by the extension of her railway system. The Trans-Caspian railway has given Russia a line running parallel to the whole northern frontier of Khorassan, so that Russian troops can at any moment enter that province from any point on the line of rail. The proposed railroad from Tifles through Erivan to Julfa will remove any difficulties in the matter of supply which may have previously attended a Russian advance into Azerbaijan, while the line of rail which is shortly to be constructed from Astara on the Caspian due east towards Ardebil will render such a movement still more easy.

A concession for a road which will open carriage traffic direct from the port of Enzelli on the south of the Caspian to Tehran, has just been given to a syndicate of Moscow merchants and the road has actually been begun. There is but one pass to be crossed, the Kharzan, the heights of which is 7,000 feet, but it presents no special difficulties, for carts can even now be brought over by the road which at present exists. The cost of the road will be defrayed by conceding to the constructing company the right of levying all tolls, while a Government guarantee of 5 per cent. on the capital expended has also been conceded. This road when completed must cause a great increase to Russian influence throughout Persia, particularly in the north, with a corresponding decrease in the influence of Great Britain. Russian goods will flood all north Persia, while it will be well known to all that Russian troops can easily, if required, follow the road which Russian merchants are now constructing.

The Russian Government has managed to arrange that the carriages used by the bullock train contractors, on the road recently made from the Trans-Caspian Railway to Meshed, are of a pattern as suitable for

the conveyance of troops as for ordinary passengers and it is most probable that an attempt will be made to compel the employment of somewhat similar carriages for the bullock train, on the road which is now being constructed from the Caspian to Kazvin.

A concession has just been given to a German syndicate to construct a road from Baghdad through Kermanshah to Tehran, the road must according to the terms of contract be completed by June, 1898. This road will not possess the same military importance as will that from the Caspian to Tehran, it will, however, establish a direct line of communication between the Euphrates valley and Persia.

English influence is without question paramount in southern Persia, but the difficulties of country which present themselves to a force advancing into Persia from the Persian Gulf are incomparably greater than those which would be encountered by a force operating from the Caspian. The distance too from Bushire to Tehran *viâ* Shiraz and Ispahan is 700 miles against a little over 200 miles from the Caspian to Tehran. Any military operations in Persia on the part of England can only be made with the Persian Gulf as a base, so that both, from a military and commercial point of view, the importance of a good road from the south cannot be overrated, without such a road our commerce and prestige must both suffer. The Persian Government will never undertake the work, so it remains for British private enterprise to carry it out on much the same principles as is the road from the north being constructed by Russia.

The most direct route into the heart of Persia from the south is by way of the Karun river and thence northwards to Ispahan, but the country through which this line of road must pass is difficult and mountainous and the population wild and much addicted to brigandage, so that it is not so suitable as a commercial route as the older road through Shiraz, the saving of distance is, however, of very great importance.

The material from which the Persian army is recruited is physically of the highest order. A large portion of the population is nomadic and such people used, from their earliest childhood, to camp life, and its shifts require merely training to habits of discipline to become genuinely good soldiers. But, as the Persian army exists at present, it is impossible for it to have any form of martial spirit. Corruption is rife, the soldiers are absolutely uncared for; under any circumstances their pay is very small and they are swindled out of a considerable part of this pittance; rations there are none and the clothing is of inferior quality. Service is practically for life, although the more modern school of officers, who have seen something of military organization in Europe, like to state that short service is being gradually introduced. When a village is called on to supply two or three men as recruits, the number required is generally found by the villagers subscribing together and paying volunteers so much ahead, who, after a certain amount of pressure from the head man, agree to represent the village in military service. The soldier when he joins the army soon discovers that this payment which has been made him

by his fellow villagers is about the only money he is likely to handle during his service and that if he is not actually to starve, he must live as best he can on this sum. He therefore puts it to the most profitable uses he can devise and, as money-lending has always produced a high rate of interest, he adopts the profession of userer and loans out one krán here and another krán there, extorting two kráns in return for each one lent. Money, although lent by the soldier at the exhorbitant rate of cent. per cent., is but seldom lost, for if the civilian borrower dares to repudiate his debt, his premises are at once invaded by the lender and other members of this military money-lending fraternity and the dishonest borrower sees at once that he will do well to continue regular repayments of the loan.

It is not to be wondered that an army, raised and supported under these conditions, should be devoid of military spirit and that where promotion must be paid for and furloughs bought no form of sympathy or confidence can exist between officers and men. In spite of all these difficulties Persia possesses the natural material out of which a good army is to be raised. The men are of fine physique and the supply of horses, although they are small in size, is very great. The systems of travelling and communication throughout the country are such, that there are few men who cannot ride, and it was with such material that Nádir Shah was able in the last century to invade India with an army of which at least 50,000 were cavalry. The number of horses in the country must, however, have considerably diminished since that time.

Any European nation that may ever be in a position to give itself a free hand in the raising of Persian troops will have material to deal with, out of which a valuable allied force could be made; time would, however, be required.

European officers of every nationality have in turn been engaged by Persia to remodel her army, but in no instance have they been given a sufficiently free hand to carry through genuine reforms, probably the English officers were during their tenure of office allowed to do more for the good of the army than any others. A most complete account of the Persian army in the present and the past is given in the Right Hon. George Curzon's work on Persia and to thoroughly understand the history and organization of the army and how its instruction has been taken in hand from time to time by foreign officers, the chapters devoted to the Persian army should be studied.

Napoleon I. fully appreciated how great must be the military importance of Persia to any country holding possession of India, with the object therefore of weakening British influence in Asia and, in India in particular, a number of French officers were sent to Persia early in the present century to reorganize and instruct the Persian army and they may be considered as the first of a series of foreign instructors who have been successively entrusted with the instruction of the Persian army. The stay of these French officers was short and, England becoming alive to the very great importance of preserving our influence in Persia, entered into negociations with the Shah, whereby the services of a few Indian officers were lent to the Persian

Government. Among these were Captain Lindsay, who undertook the training of the artillery and who remained in the service of Persia for over forty years, while to Major Christie was entrusted the instruction of the infantry. This officer served in the Perso-Russian war of 1812 and was killed in one of the actions of that campaign while commanding his regiment. Notwithstanding the many different nationalities which since this period have undertaken the instruction of the Persian army, many of the words of command still in use are the words introduced by Lieutenant Christie.

Political differences with England caused the English officers to leave Persia and France and Russia again undertook the instruction of the army. After more than a quarter of a century Persia once more turned towards England for a supply of officers and had the good fortune to secure the services of Major, afterwards Sir Henry, Rawlinson. Various nationalities have since followed, till it is a matter of wonder that, under the various systems of foreign instruction introduced, the Persian army should continue to exist. In 1878 the Shah visited Europe, but owing to the barbarous manner in which, on his return from Europe in 1873, he had caused a number of his soldiers to be executed, he had incurred the displeasure of Great Britain and the hospitality of our country was not offered to him. He therefore confined his visit to the Continent, where he was much pleased with what he saw of the Austrian army and the services of several of their officers having been obtained, the training of the Persian army on the Austrian system of drills was begun. Russia did not however like to see herself in any way ousted, so while the infantry and artillery were being instructed by Austrian officers, the cavalry were partly handed over to Russia, who for this purpose permitted six cavalry officers and about the same number of non-commissioned officers to take service in the Persian army. As the terms of service have expired, the officers have not been re-engaged, till at the present moment the artillery has entirely passed into the hands of Persian officers. In Tehran three Austrian officers and one Italian, who at one time served in British Government employment in the Egyptian gendarmerie and wears our medal for service at Suakim, form the instructional staff of the infantry. Three Russian officers with a few N.-C.O.'s are employed with the cavalry. Two German officers and one or two Frenchmen are also engaged in the cadet's school.

The prestige of England, owing to our great commercial ascendancy, is still very strong throughout Persia, although it meets with a great rival in Russia. The political situation has been graphically described as a game of billiards in which the English and Russian Ministers are the players, while the diplomatic representatives of the other Powers merely look on from the side benches. It cannot be wondered if the prestige of Russia, as a military Power, should be in the ascendant. The strength of Russia is a very tangible fact, while the reputation of our military Power is becoming a matter of hearsay and history. The Persians know that England must be powerful, even by her wealth alone, but it is to be feared that they are inclined to regard us more as

a nation of shopkeepers than of soldiers. The Persian opinion of Russia is the very opposite, her Power has been proved in several campaigns in which Persia has come off second best, while all along the northern frontier of Persia the once dreaded Turkoman has been completely crushed by the force of her arms. The Cossack is seen at every point along the frontier and the many thousands of Persians who travel every year by the Trans-Caspian railway to the shrines of Meshed see much of the military power of Russia which impresses them. Under such circumstances it is not to be wondered that the military greatness of Russia should be unquestioned, Russian troops completely shut in Persia from the north, whereas, except in the very south of the country, an English soldier has never been seen.

ARTILLERY FROM AN INFANTRY OFFICER'S POINT OF VIEW.

BY

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(D.-A.-A.-G. Dublin District).

(A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 12th March, 1896).

GENERAL THE RIGHT HONOURABLE SIR R. H. BULLER, V.C., IN THE CHAIR.

CHAIRMAN—Gentlemen, I have much pleasure in introducing Captain Pilcher to you.

CAPTAIN PILCHER—Sir Redvers Buller and gentlemen, I should not presume to address this assembly on such a subject as mine were it not in the hope that by so doing, I may encourage my brother linesmen to devote more time and thought to considering artillery questions. For it is only by studying the strong and the weak points of the other arms and by playing up to them that we can afford each other that mutual support which is absolutely essential to good results.

Many infantrymen have a fixed idea that there is some mystery connected with artillery subjects which cannot be solved by anyone not belonging to that arm and, further, that it would be profanity in an outsider to try to solve these esoteric questions. That, however, this is not the case is proved by you having so kindly invited me, a linesman, to lecture to you here, at the Royal Artillery Institution at the Head-Quarters of Artillery in the British Isles on an artillery subject.

Co-operation between artillery and infantry has always been a matter of importance, but it is doubly so now that modern improvements have rendered artillery proportionately more effective and have at the same time made it practically impossible for attacking infantry under ordinary circumstances to drive defending infantry from a position until the latter have been thoroughly shaken by artillery fire.

Now to be able to turn its attention to the hostile infantry, the artillery must first have gained an ascendency over the hostile artillery,

[1] Any member particularly interested in the results of artillery fire in Germany can receive further details by applying to Captain T. D. Pilcher, D.-A.-A.-G., Dublin District.

and let us consider what is necessary to enable it to do this. Some of the chief points are :—

A more careful use of the ground,
Better fire discipline and accuracy of fire,
Better *matériel*,
Greater mobility,
Greater numbers.

May be that I am wrong in putting a careful use of ground first among the essentials for a good artillery, but it seems to me that fire discipline, first class weapons, mobility and numbers can be of but little use if we allow the enemy to make the best use of ground and fail in this respect ourselves.

To take a case in point, on an artillery tactical field day I once saw three batteries come into action on a high ridge, two on one side and one on the other of a group of high firs, and at once open fire at where they thought the enemy was. I say advisedly at where they thought he was, for they failed to discover him until they had been pounded by him for some five minutes, during which time they, in their exposed position, would have been shot to pieces. As a matter of fact the enemy was in position at a range of about 2000 yards on much lower ground, firing cordite and with a dark wood just behind him. It was no doubt principally owing to this last fact that he was so hard to discover. Now no excellence on the part of the artillery could in this case have made up for the original fault in the use of ground made by the commander.

I cannot help thinking that we Englishmen, cavalry, artillery and infantry alike, trust too much to our instincts as sportsmen, and do not sufficiently study ground from a soldier's point of view. The Germans on the contrary look at ground only from a soldier's point of view and although most of them would make a poor show at finding their way over a nice piece of Leicestershire they are masters in getting the greatest use out of every fold in the ground. To be able to make the best use of a country in a military and in a sporting sense are neither alternatives, nor are they the same thing, but both require a quick eye, presence of mind, determination and courage.

A good man to hounds, who can ride his own line, is pretty sure to have these qualities highly developed and they are essentials, but they are not everything or a hunt stables would team with commanders if, however, besides these qualities an officer possesses coolness and a thorough knowledge of his profession, he is sure to inspire his subordinates with confidence and will be a leader of men with a grasp of his situation and an ability to act on it, not possessed by a man who has not been trained to seize his opportunity either in war or in that pursuit which a great authority has declared to be its image.

If the careful study of ground be neglected with us, as I am inclined to think that it is, reasons for it are not hard to find. Half of our soldiering is done on the plains of India, where the flat ground offers but little scope for utilizing contours, and a great deal of the other

half at stations like this (Woolwich) where the limited extent of Government ground available makes its careful study impossible.

The above remarks apply equally to all branches of the service and certainly not more to artillery than to the other arms, but as artillery is the subject which we have in hand this afternoon, perhaps I may be permitted to describe the way in which German artillery come into action, for I have had opportunities of studying the German army, which have been enjoyed by few foreign officers.

The commander of a unit, whether a brigade, battalion, battery or company, is always blamed if he sticks too close to his unit when approaching the enemy, he should, according to their ideas, ride away well in front, study the ground and watch how, where and when he can most affectively and with least loss lead his command into action. In accordance with this rule the artillery commander is well away in front and, having chosen a position, orders his batteries to be brought up. If the position be a hill the guns are unlimbered 20 yards behind the crest and are brought up as much further as necessary by means of drag-ropes. I have often watched a position on which I knew it was the intention to bring up the artillery and have seen neither man, horse, nor the sign of a gun until fire was opened simultaneously from all the batteries. One battery is not allowed to open fire until all are ready, lest by drawing the whole hostile fire upon itself it should be crushed in detail. All that one sees of the guns in such a position is a flash from the muzzle, and it is extremely difficult to locate the position of a battery if one sees nothing but his flash. Only smokeless powder is used. If the ground and trajectory now admit of it (and it must be borne in mind that the trajectory of the German field gun is a good deal higher than that of our 12-pounder) the guns are now further withdrawn and indirect fire is entirely resorted to. I may say that indirect fire with clinometer elevation is rather the rule than the exception. Clinometer elevation most decidedly is the rule, as it is considered that much better practice can be made with the *richt-bogen* or spirit-level than with tangent scale elevation. The *richt-bogen* is moreover invariably used with high explosive shell, with which a great nicety of elevation is necessary for good results.

Every gun also carries a *richt-fläche* or kind of a sight-rule on a pivot, which can be fitted to the gun in a second and which has attached to it an arc off which can be read the angle which the sight-rule directed on the auxiliary object makes with the line of fire. The following instance will serve well enough to illustrate the manner of procedure.

On a certain day at last year's manœuvres the western artillery was in position, when seven batteries of the eastern force galloped up and unlimbered behind the crest of a hill. From the guns of six out of the seven batteries the hostile artillery position was quite invisible, but it happened that it could be seen from Nos. 1 and 2 guns of No. 5 battery. These two guns were laid direct on the hostile batteries, and after they had been laid the *richt-fläche* was directed on a church steeple about a mile off and the reading passed to the other guns. When the guns had once got the direction in this manner, the point of a sword

was laid against the off wheel of every gun, a rod stuck in the ground behind the gun and in line with the sights, firing was commenced and the gun laid back on the rod. The whole thing was done in much less time than it has taken me to describe it. Perhaps, however, the more ordinary manner of procedure is not the one above described, but is first to lay the guns directly and then to retire them, after having fixed the rod in the ground as above.

Twenty paces is the ordinary interval between guns, but I have often seen 40 taken with the intention of deceiving the enemy as to the strength of the artillery, for when hostile artillery is a mile off and all that is seen of it is a flash from the muzzle, it is very hard to say at what interval the guns are placed.

I have tried to describe the manner in which German artillery come into position when good positions are to hand and the guns are not over crowded. I have, however, when positions have been limited, seen guns in action with only 10 paces interval, but it is considered as the result of experiments that artillery with guns at 10 paces will suffer four times as much loss as with guns at 20 paces. A smaller interval than 20 paces is consequently never resorted to if it can be avoided.

I have also seen two, and on one occasion three tiers of fire used. On the latter occasion the ground sloped about one degree to the front, and there was about 300 yards distance between lines. Guns were firing at artillery, range about 2500 yards, and they were firing over a valley.

When once established in a good position, the German artillery are most averse to leaving it, and I have never, at German manœuvres, seen the artillery brought up close to the infantry lines previous to an assault. What the artillery does do previous to and during an assault is to redouble its fire, giving 200 or 300 yards more elevation and length of fuze in order to catch the hostile reserves moving up, and to preclude the possibility of hitting its own assaulting troops. The argument is used, that it benefits the infantry but little to have moving targets composed of their comrades of the artillery galloping about behind them, whereas the continuous fire of their guns is of the utmost value to them. I have talked to many officers, who were through the Franco-Prussian War, on this subject and have invariably been told that the occasions on which guns pushed up to within infantry range to support the attack were exceptional, and that when they occurred, some specific object was in view, as to knock down the walls of Fröschwiller at the battle of Wörth, which, owing to the configuration of the ground, could not be bombarded from a distance, and behind which the French were making a last stand. In answer to a question of mine on this subject, I have just received the following answer from a distinguished German officer which rather modifies what I have just said. He says: "I am of opinion that both in attack and defence artillery must not be exposed to infantry fire at the commencement of an engagement, or until the hostile infantry have suffered and been shaken. In defence artillery should if possible be 500 metres behind the infantry. Nevertheless it may be advisible in the attack just

before the assault to send forward a few batteries into the foremost line. This procedure is also admissable in the defence to defeat the hostile attack. The moral effect of artillery in these circumstances will be very great. In these cases we may consider the hostile infantry as thoroughly shaken, and with shaken infantry one may dare to take liberties." But I must adhere to what I have said and I have never seen this done at manœuvres.

There are no hard and fast rules regarding tactics in Germany. Ground cannot be altered and formations can, and that formation is considered best which is best adapted to the actual ground and to the circumstances of the individual case. In conformity with this principle attack formations for infantry are never allowed to be practised. A general officer, whose opinion on tactical matters is highly valued, and with whom I have had the advantage of very many long talks, once said to me, "I divide commanders into two: Firstly, those who devise attack formations and apply them to the ground whatever it may be. Secondly, those who take the ground as it is, and who can on the spot make the best use of it. 'The former I do my best to rid the service of, the latter are my men.'"

Before leaving the subject of ground I should like to remark on the manner in which the Germans prepare positions for defence, but do not occupy them until the enemy has definitely shown his hand. Nothing is blamed more than a too early deployment either in attack or in defence. Let me quote the following example of what I mean. On the last day of the manœuvres at which I was last year present the division with to which I had attached myself had received warning over night that it would probably be attacked next morning by a much superior force, and that it could not expect reinforcements until mid-day. It had consequently taken up a defensive position, shelter trenches were dug and gun-pits thrown up behind them. Three artillery positions were prepared, one facing S.E., one S. and one S.W. There were only two brigade divisions, *i.e.* sufficient batteries to occupy two out of the three positions prepared. Only a very thin line of infantry was thrown into the trenches, just enough to prevent inquisitive hostile cavalry coming up too near, and the whole of the rest of the force was kept in reserve under cover. Officers commanding sections in the line of defence receiving most definite orders not to occupy any part of the line in force, until it was beyond doubt that the enemy meant to attack it. There was excellent cover, a quarter to half a mile, behind the trenches.

Later on this same day it became evident that the enemy had 20 batteries and four infantry brigades, whereas the defending force consisted of six batteries and two infantry brigades. I asked the officer commanding the defence how long he thought he could hold out until support came. He said, "the mist to-day helps me, but on a clear day I could not hold out more than two hours in the face of the enemy's superior artillery fire," and turning to the officer commanding artillery, he asked him his opinion. He said, "I think, sir, you have over stated the time, I would not give you more than $1\frac{1}{2}$

hours." This shows the enormous weight laid by the Germans on artillery fire. The hostile artillery positions were no better than those of the defence, and the defensive line of trenches was a very strong one, with a clear field of fire.

It is the rule for artillery in position to reconnoitre to its flanks by means of officers. On one occasion which I can call to mind this was not done and this neglect was severely criticised, for had an officer with glasses galloped half a mile to the flank he would have discovered the hostile artillery massed at about 3000 yards, behind a hill and well within reach of indirect fire.

From the question of ground we come to that of fire discipline and accuracy of fire. The rules as to the massing of guns, which obtain here obtain in Germany also, but great stress is always laid on keeping the whole of the troops firing at you under fire, for it is considered that the effect of the the enemy's fire decreases 50% directly he hears bullets whistling about his own head.

At ranges over 1500 yards the guns of a battery fire in turn, at ranges under 1500 yards they fire independently.

No range-finders are used either for artillery or for infantry and German artillery officers say that their shells are their best range-finders.

The only missiles used by artillery are shrapnel, high explosive shell and case. The shrapnel has a combination time and percussion fuze, and contains a smoke-making substance, the smoke from which hangs together and rolls away like an old-fashioned cannon ball, and is very distinctly visible indeed. The use of this smoke-making substance lessens the difficulty of range-finding immensely.

The chief use of high explosive shells with field guns is to reach troops behind trenches and earthworks, which would give them cover from ordinary shrapnel fire, and the manner of procedure is to burst the shell immediately over or just behind the cover, the force of the high explosive overcoming the velocity of the shell and sending the contents of the shell in all directions.

Firing at shelter trenches field guns have a very fair effect when fired with time fuze, and much better than howitzers, mortars or garrison guns fired with percussion fuze at the same objects. The latter fire too slowly and have to drop their shell right into the trench for it to be effective. High explosive time shells would at all events make it so disagreeable for infantry in a shelter trench that they would not stay still to be shot at without showing themselves, and if they show themselves the object would be attained and shrapnel fire could be commenced. Two things are necessary for good effect with high explosive shells: Firstly, the length of fuze requisite must have been carefully ascertained with shrapnel. Secondly, there must be plenty of ammunition. High explosive shells from guns and howitzers dropped into the ditch of a modern earthwork will demolish everything for yards in every direction.

The Germans expect much better results against troops in the open with ordinary than with high explosive shell and will never use the

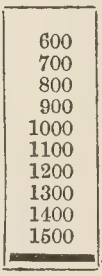
latter unless the enemy cannot be reached by the former.

I should like now to give a short description of the *platte*, a little contrivance which is generally made use of when firing with the tangent scale and which renders it possible always to command the same distance for the time fuze and for the sights, thus avoiding confusion.

The time fuzes are marked in yards, not in seconds, the fuzes are inclined to burn too long, *i.e.* if timed to burst at 1500 yards the shell is pretty sure not to burst under that distance, but under certain atmospheric conditions will often not burst until the shell has travelled 1600 yards.

It was found formerly, when it was occasionally necessary, to give an elevation for say 1500 yards and to use a time fuze for 1400 yards that mistakes were liable to occur, and in order to obviate this a *platte* is now used.

Under the above conditions the order would now be 1400 yards with two *platte*. The *platte* is a thin piece of metal which fits round the bottom of the tangent scale and obscures, roughly speaking, the last 50 yards elevation written on it, *i.e.* if put into this diagram one *platte* would obscure the figures 1600 and the sight would read 1550 yards. One *platte* is equivalent to about 50 yards elevation.



Platte.

The advantages of this method are obvious, as they preclude the possibility of a slip of the tongue or of a misunderstanding from two distances being named. When using the *richt-bogen* it is also possible to command only one distance. Atmospheric conditions or differences in height between the gun and the target being made up for by the use of a screw which alters the lie of the spirit-level.

It is not my intention to enter into the much contested questions regarding the respective advantages of a small bore high velocity and heavy carriage, as against a larger bore lighter carriage and less muzzle velocity, but I should like to mention a few of the most salient points in which German *matériel* differs from our own.

There is about 47 cwt. behind the horses going into action in a German field gun, in one of our own about 45 cwt. A German battery has nine waggons, two of which contain high explosive shell, each waggon contains 75 shell and there is about 45 cwt. behind the horses. We have six waggons per battery, each containing 72 shell, and there is about 42 cwt. behind the horses. A German battery carries 140 man-killing projectiles per gun, excluding case, 115 of these are shrapnel with time and percussion fuze and 25 of them are high explosive. We carry 80 shrapnel and 20 common shell, but the amount of ammunition carried is being increased. The bore of the German gun is 3·5″, of ours 3″. Our shell and fuze weighs 12 lbs. 8 ozs. and contains 180 bullets. The German shell weighs about 18 lbs. and breaks up into 300 pieces. Nothing but smokeless powder is used with German field artillery.

Our gun has the greater muzzle velocity and the flatter trajectory, the German gun has the greater searching effect even with its ordinary shrapnel shell. There is no question that our guns are better horsed than the German and their mobility is greater. The Germans cannot turn out their horses, guns or harness anything like as smartly as our gunners do. It is marvellous how the Germans manage to get the amount of work out of their comparatively badly bred animals, which they undoubtedly do get out of them, and the reason they manage to do so is principally attributable to their excellent system of buying their horses as four-year-olds and keeping them in the riding school until they are six. They very seldom cast a horse until he is 18 and often not until he is over 20.

Whether we do not sacrifice too much to lightness having as we undoubtedly have better horsed artillery than any on the continent is a question I will leave to artillerymen. I say advisedly than any on the continent, for in this respect all accounts tell us that the Germans are far ahead of their possible antagonists. Whether also our present turn out does not necessitate too much time being devoted to spit and polish is a question which I will not enter into.

We now reach the subject of numbers. In the German army the proportion of guns to rifles is between five and six guns to 1000 men and the tendency is to increase the number of guns. At present the artillery is directly under the corps commander, but it is contemplated to split up regiments and to allot one artillery brigade of two regiments to each infantry division. As I have already said enormous worth is in Germany laid on artillery fire. What the number of guns per 1000 men is, which we can afford to our regular and auxiliary infantry is no doubt known to most of my audience better than it is to me.

There are still a few remarks which I should like to make upon some points which I saw in Germany and which I consider to be of interest.

On the line of march the artillery generally followed the leading battalion, but in the case of a long line of guns a couple of companies were put in between every fourth and fifth battery.

A cavalry escort invariably accompanied artillery moving into position. When once in position the cavalry were usually relieved by infantry, unless there happened to be other troops in the immediate neighbourhood, in which case no further escort was provided, it being laid down that it is the duty of the nearest troops to secure the safety of the guns. In the case of a special infantry escort this escort was usually thrown out in front of the guns.

For artillery to fire over the heads of infantry was not the exception, but the rule, being done every day. Sometimes the artillery in position and firing was only 150 yards behind the infantry line, and it must be borne in mind that the Germans only practice that in peace which they mean to carry out in war.

On a certain day at last year's manœuvres a rear-guard action was being fought and I was much struck by the masterly manner in which the artillery used the ground, never letting the attacking infantry

within 1200 yards of them and retreating from position to position, hardly exposing themselves to fire and always, when in action, keeping their horses under cover. It is considered that in a delaying action infantry should never allow hostile infantry to get within 600 yards of them, for that if they do so they will find it impossible to withdraw.

The key-note of the whole German army and the secret of its efficiency is decentralization. This begins from the bottom and works up. From the day an officer joins he is accustomed to responsibility. Commanders of squadrons, batteries and companies are practically independent, their immediate superiors may inspect them, but are forbidden to lay down what parades they shall hold. At manœuvres I have never seen any interference on the part of battalion or regimental commanders with their subordinates, a man receive his orders and he is allowed to carry them out his own way. An officer is often asked afterwards why he did so-and-so, and is either praised or blamed for his correct or false appreciation of the situation. It is acknowledged that in war a company once committed to action is like an arrow from a bow which can only be gathered when the ground over which it was sent has been won. It is acknowledged that the only way of sending up orders to the firing line will be through reinforcements and when a company is once committed to action the commander is independent.

If an officer is found to be unfit for his responsible position, and every post carries with it a great deal of responsibility, he is retired with a small pension, and this is a matter of every day occurrence, a great number of compulsory retirements taking place in the lower ranks.

This system of decentralization immensely lightens office work. There are two staff officers to a division, each of whom does on an average two hours office work a day, for hardly anything gets as far as the divisional office and still less goes past it. But to return to the subject of my lecture from which I fear I have diverged.

There are one or two points on which I should—if I am not delaying you too long—like to say a word or two.

It is a disputed point at what distance infantry on an equal front will be able to get the better of artillery and the following results of firing at long ranges may be of interest. At Meean Meer at 1900 yards at two targets, each 8′ × 12′, 1360 rounds were fired, these rounds could have been fired comfortably in four minutes by 100 men, there were five hits, that is ·36%. At Karachi at 1300 yards at a target representing five guns, 20 gunners and also two screens 2′ × 12′, representing an escort, 620 rounds were fired, there were 15 hits, *i.e.* 2·42 per cent., this would represent the fire of 100 men for two minutes.

I should like to quote the opinion of a distinguished German officer on this subject in writing to me, he says: "We are of opinion that at 1100 yards and at all nearer distances infantry will get the better of artillery, if both open fire simultaneously, and that they will gain the upper hand even if the artillery are able to provide cover for their men up to their waists. It is only when ground is so formed that

the guns only show their muzzles above the crest that artillery can fight at such short ranges."

There is no doubt a great future for machine guns, and as the results which I am about to quote will show a machine gun is at practically all targets equal to the fire of 30 rifles, and at some targets equal to a great deal more. One great advantage they have over infantry is that you can see with them where your bullets are going and can range, moreover, being as they can be in the charge of picked men, the chances are that hits in war will bear a better proportion to results obtained in peace than would be the case with ordinary infantry fire.

In no way can machine guns take the place of artillery in European warfare any more than they can supersede infantry. They will, however, if properly used, be a most valuable adjunct to infantry and in many cases, such as holding a defile, guarding a flank etc., will often free half a company. Moreover it would be difficult to exaggerate the effect which, under certain circumstances, a few determined men with a machine gun and a bill-hook to improvise a little cover from view, could have on an advancing column. Cavalry, however good they may be, cannot search every bush in an enclosed country and a machine gun does not take much concealing.

The following comparative results of machine gun and rifle fire made at Hythe last autumn may be interesting.

Target a battery of six guns, 54 gunners, six limbers, six ammunition waggons at five ranges between 1550 and 1700 yards. Firing 633 rounds which they could fire in one minute, two machine guns got 81 hits on, including 17 on the gunners—40 men firing 600 rounds at the same target, which they could fire comfortably in about five minutes, got 53 hits on, including 18 on the gunners. The per centage of hits on the whole target, guns, limbers and gunners was in the case of the infantry, 8·83, and in the case of the machine guns, 12·79.

We may calculate that in either of the cases just quoted about 15 gunners, *i.e.* 28 per cent. of the men of the battery were hit. The distance was found with a mekometer previous to opening fire. It may be presumed that the 40 men shooting were all picked shots, or they would not have been at Hythe.

It probably took about one minute to get the range with the mekometer.

I think that we may safely conclude from the above experiments that at ranges over 1000 yards, and sometimes as great as 1700, both infantry and machine guns may reasonably expect under favourable circumstances to make it extremely hot for a battery, if they are already in position when the battery comes into action, and they will have the great advantage that they are usually much more easily concealed than artillery, and they may inflict heavy loss without the enemy knowing whence the fire is coming. I am speaking of the exception, for there is no doubt that under ordinary circumstances artillery can, even in peace in a given time with a given frontage produce more effect on a target than infantay can at ranges much over 1000 yards.

There is great difficulty in deducing from peace experiments what is likely to be the effect of fire in war, for here human nature has to be taken into consideration and this is a factor for which we cannot legislate. All experience teaches that only a very small per centage of the effect produced by a body of troops firing in peace can be expected in war, and that percentage will vary in proportion as the troops firing are well or badly disciplined. Whatever the above per centage is with infantry, it should be greater with artillery, who for many reasons are less influenced by the altered circumstances of the case. This fact must be borne in mind in connection with the comparative effect of artillery and of infantry fire at more or less similar objects in peace.

The following are, I think, among the chief points which strike an infantryman when first seeing artillery practice. Knowing how very easy it is with a rifle to fire to the right or to the left, infantrymen find it hard to believe that the lateral error of artillery is "nil" and that the depth covered by shrapnel is as great as it is. Perhaps it is owing to this fact that we so often at manœuvres, and on field days see infantry advancing in fours within easy artillery range.

Again an infantryman is apt to forget the great difficulty, which artillery will undoubtedly have in ranging in war, and the enormous difference which the ground on which shell burst makes to artillery in finding their range, and consequently an infantryman is also apt to forget the necessity (insisted on in the drill-book) for infantry in their advance to avoid prominent objects on which artillery find it easy to range. On this point I should like to remark that the smoke-making substance in the German shell which makes the smoke hang together after the shell has burst, when fired either with time or percussion fuze, must immensely facilitate ranging on difficult ground.

In considering artillery questions an infantryman is also apt to forget the difficulty which artillery will have in observing the effect of their own fire at long ranges, and also their difficulty in distinguishing their own from the enemy's troops, and in this respect he is inclined to attribute to them powers of vision and of discrimination, which are more than human.

Modern guns firing shrapnel have never yet had an opportunity of showing what they can do on a battle-field, and one of the first surprises of the next European war will be that we shall hear that artillery, under favourable conditions, have within a quarter of an hour swept away half an army corps.

In conclusion I have only to thank you for the kind manner in which you have listened to me and to assure you that if I, an infantryman, have said that I see a moat in my brother's eye, that I am perfectly aware that there is a beam in my own.

DISCUSSION.

MAJOR E. S. MAY.—Sir Redvers Buller and gentlemen, I wish someone better qualified than I am had been called upon to open the discussion which is sure to follow so excellent a lecture as the one we have just heard; but since it has fallen to my lot I feel I cannot do better than commence my remarks by assuring Captain Pilcher of the great profit and pleasure with which I have listened to what he has had to say; and I am sure I can speak for all of you when I tell him how glad we are to hear an infantry officer lecture in this theatre, especially when he deals with a subject which appeals particularly to us, and brings with him so much valuable information. There are a great number of officers, I have no doubt, who wish to enlarge on different points this evening, so I will only confine myself to one or two, speaking, I trust, in no critical or controversial spirit, but rather seeking for further details which may clear some doubtful matters up. The thing that puzzles me a little and which I feel most interest in personally, is this high explosive shell which Captain Pilcher has alluded to. I think we all recognize the value of such a projectile in this country, and personally I have always been an advocate of howitzers, but we have had a certain number of very serious difficulties to contend with hitherto in connection with it. It has been recognized first of all that this high explosive shell, unless fired with a very low velocity, may burst prematurely and that, if such a thing occurred, it would probably shatter and destroy the gun altogether. I should like to know whether, and, if so, how, the Germans have completely got over their difficulty in that respect and if they are not troubled by our anxieties. Then there is a difficulty with regard to ranging with high explosive shells. The high explosive gives off hardly any smoke—the burst is shown simply by a flame—it must often be extremely difficult to see that flame, and unless there is some smoke-producing compound included in the shells I find it difficult to understand how they can pick up the range for us, especially when fired in the air with a time fuze. Moreover the presence of adjacent batteries or guns would not greatly facilitate the task. Because we must remember that although we might have a battery firing with ordinary field guns exactly alongside one using these high explosive shells, unless the same fuzes were used to ignite them and the ordinary shrapnel, I do not see how its experiences would help us very much; we all know that, even if we fire with fuzes of exactly the same pattern, there is the error of the day to be accounted for in the case of the fuzes as much as in the case of the powder charge, and that the same pattern fuzes unless of the same date of manufacture do not always burn at the same rate, and where the fuzes were not of the same pattern, as I presume they would not be in the case referred to, it seems to me that the results obtained with one battery would help you very little with respect to another. And again, do the Germans use a high explosive in the shells of their ordinary field guns? Because in this country, I think I am right in saying that the best authorities do not regard a high explosive from so small a gun as a 12 or 15-pr. of very much account. Even with the largest field howitzer hitherto introduced I do not think that the diameter of the circle which may be taken to represent the area over which the high explosive operates is more than about 30, or at the outside 40 yards; it has indeed been put as low as 10 and 20 yards, although that is probably a false estimate. When you consider the depth that the shrapnel covers effectively I think it is easily understood that if you only made use of a small shell, such as an ordinary field-piece fires, you would get a very small destructive area and must lose a great chance of hitting men. These are some points I wish to ask Captain Pilcher about particularly.

Then there is another matter that needs clearing up and upon which the Lecturer with his foreign experience may be able to enlighten us. Do the Germans

when a small body of troops is concerned, attach artillery to the advanced guard? By a small body I mean a force of a division or thereabouts. There is nothing laid down in our official manuals upon that point; but I have noted that some books on tactics in this country say that it is right to attach two guns to the advanced guard of a division. The idea of breaking up a battery will hardly commend itself to any of us; and I understand the French do not allot any artillery at all to an advanced guard if it be smaller than an infantry division. It would be interesting to hear what the German practice is.

Finally, perhaps, I may be allowed to mention a question connected with infantry and artillery tactics which rather interests me. The other night I was lecturing myself to an Infantry Tactical Society and I was asked during the discussion which followed by an infantry volunteer colonel, "How do you recommend infantry to attack artillery?" Now I do not think it would be of the slightest interest to anybody here to know what answer I gave; but I dare say many would like to hear what Captain Pilcher has to say upon that subject and so I will pass the question on to him, if he will let me. I may, however, say this that I cannot think the cut and dried procedure we sometimes see at manœuvres is a judicious one. An infantry attack is broken up into five lines altogether, and it can hardly ever be right for them to advance straight on the guns as we sometimes see them do. There is a first line, a second line and a third line in the orthodox formation, and the first line is further to be sub-divided into three parts, firing-line, supports and reserves. I think when those five lines come rolling on that, if we do not hit the first we may expect to hit the second, and if we do not hit the second we ought at any rate to hit the third, if we did not, the fourth at least should receive the benefit of our shells, but, if it did not, and the fifth escaped also, then indeed we should have cause to blame our ammunition.

Captain J. Headlam.—Sir Redvers Buller and gentlemen, there is so much that is interesting in Captain Pilcher's lecture and I agree so fully with the greater part of what he has said, especially as to the necessity for the most cordial co-operation between the artillery and the other arms that I feel as if it would be rather ungracious to criticise. At the same time there are some points in the lecture in regard to the training and equipment of German Field Artillery which, if they were left without remark in such a meeting as this, might naturally give the impression that *in those respects* the Germans were ahead of us. I believe the contrary to be the case. The first point is the equipment itself, the general question of the weights and the amount of ammunition carried. Captain Pilcher said that the weight of the German shell was about 18 lbs., the weight I have always heard of is 15½ lbs., which ever is right, it is of course, a heavier shell than that of our 15-pr. The number of rounds per gun carried in a German battery is 147, in our 15-pr. equipment it is 144. But to carry their extra three rounds a gun they have nine waggons instead of six. You must remember that these nine waggons are not with the battery, or even with the brigade division, four only are with their batteries, the remainder are behind the whole artillery unit; that is to say, behind all the divisional, or all the corps artillery you have this great mass of waggons, in the case of corps artillery amounting to 40 waggons. That is not quite the same thing as being actually with the batteries. It certainly seems to me that we are better off with 144 rounds and six waggons, than the Germans with 147 rounds and nine waggons. In the Horse Artillery they have indeed got a considerably heavier shell, but they have also got 6 or 7 cwt. more than we have behind their teams and only 32 rounds with gun and limber while we have 50. I am sure that all horse artillerymen will agree with me that for Horse Artillery requirements our equipment is far superior.

The other point I wished to touch upon was the training as regards fire from

behind cover. The Lecturer has said that with the Germans now this fire is practically the rule and he has described to us the instruments used. They are in my opinion very interesting but very complicated; the French, I believe, have still more complicated ones, the Italians also and I daresay the other nations. What I want to assure officers and I have practised with these German instruments, is that our aiming posts will do all the work that the *richt-fläche* does very much more simply and accurately. But the question of what instruments you use is not important, we all know that under favourable circumstances you can make very accurate practice from behind cover. It is to the use of such practice on the battle-field that I believe there to be such strong objections as to render any general employment of it absolutely out of the question. To begin with, it is very rare to find ground where you can carry on the practice with more than a single battery. Besides that you cannot change your target without making all sorts of elaborate arrangements, you cannot concentrate your fire and you cannot fire at moving targets at all. Those are, to a certain extent, technical objections. There is a very much stronger one and that is the moral objection. If you train Field Artillery to consider firing from behind cover as "practically the rule," I believe you will destroy the whole spirit of the arm and I cannot help thinking from what the Lecturer has said, that that is what is occurring to some extent at any rate in Germany. The Lecturer says he has never seen in the manœuvres the German Field Artillery accompany the infantry in attack; he certainly read a letter from a distinguished German officer who pointed out that some persons, at any rate, considered that they should do so; but, if the Lecturer has never seen it done, it must be sufficiently rare and if batteries do not do it at manœuvres, will they do it on service? In the Franco-German War there were many occasions where the artillery came up to very close ranges, not only for such special purposes as the Lecturer has mentioned. For instance, in the battle he has referred to (Wörth) the batteries prepared the way for the assault of Elsasshausen by their fire at very close ranges, and then when the village was carried and the German infantry, as the official account admits, was absolutely unable to withstand the French counter attack, two batteries of Horse Artillery coming into action on the ground just won, stopped that attack with ease. I know that I am not alone in thinking that such occasions will occur again, and I firmly believe that if in manœuvres you train batteries continually to use fire from behind cover, and to remain in their positions while the infantry advance when in war, occasions arise for their use at close quarters *they will not be there.*

In conclusion, there is one question I should like to ask, the Lecturer has spoken about firing in tiers—sometimes two and three tiers—I should like to know whether the German artillery ever fire in tiers in reality at practice, or only with blank at manœuvres.

Major H. C. Sclater.—Gentlemen, there was one point which the Lecturer dealt with for a considerable time and that was the question of long range infantry fire and the effect likely to be produced by infantry firing upon guns. I may mention that I was very much interested last year and the year before, in some small experiments instituted by Lord Wolseley, then commanding in Ireland, which took place at Glenbeigh in connection with this subject, from which we all got a great deal of instruction—both infantry and artillery. In Ireland there was at that time no infantry range upon which long range firing could take place, though that is being remedied now, whilst in England the ranges are few; and I would strongly urge that our artillery ranges should be utilised for combined field firing by infantry and artillery, and that a detachment of infantry should also be present during at least a portion of the period when gun practice is being carried on. Their presence being utilised by firing at various ranges at targets

such as artillery would represent on service, and from which gunners would derive much instruction as what they might expect to encounter on service, and enable them to draw tactical deductions therefrom; such practice could not fail to be of interest to the infantry, as giving them the opportunity of ascertaining the vulnerability of an artillery target, and the best way to attack it. The general deduction we drew from our experiments was that horses should not be brought within 1500 yards of steady infantry when coming into action or on the march. When limbering up at that range difficulty would be experienced and if you come into action against infantry in position who were not being fired upon by anybody else at ranges under 1500 yards you would lose most of your horses or a great number of them. With regard to the gun detachments we found that at 1200 yards but small results were produced by very carefully aimed volleys from a line of rifles occupying much the same front as the guns they were attacking, but when they got to 1000 yards the detachments began to lose fast, though with well posted guns and detachments it seemed as if the guns could be fought for some time. Beyond 1500 yards the effect of long range rifle fire rapidly diminishes, as a rule the fall of the bullet cannot be seen, and except at large targets and when ammunition is abundant it is not worth the expenditure of the ammunition. Some good practice was made at a target representing a battalion in quarter-column at a range of 1800 yards, but very poor results against guns in the open at this range. Beyond this range results were practically nil. It is perhaps worth noting that even last year there seemed to be quite an open question as to the best way of firing these long range volleys, the size of the fire unit and what the system of distribution of fire should be adopted, we also noticed that better results were obtained when the volleys were fired quickly with little interval, than when fired deliberately with careful working by N.-C. officers and officers. These questions were much discussed by the infantry officers who were present at Glenbeigh at the time, including the officers of one of the courses which was then at the camp. Such combined practice cannot fail to be of interest to all concerned and I trust that it will be an annual institution at all our Camps.

Lieut.-Colonel C. M. Downing.—I desired to ask a question which, however, has already been asked, about the advance-guard battery. There is nothing in the infantry drill-book which makes it a normal condition for the advance-guard battery, say with a division, to be with the advance-guard. I think the general feeling now on the continent, both in France and in Germany, is to keep the brigade division as much as possible together, and if the advance-guard find that they require artillery that the leading battery could easily be pushed forward in time to support the advance-guard, but that otherwise the batteries should remain together near the head of the main body.

Lieut.-Colonel R. W. Rainsford-Hannay.—Sir Redvers Buller and gentlemen, a good deal has been said about high explosive shell this evening. The following paragraph taken from a lecture delivered by Major Shewell, R.A., at the Royal Engineer Institute, Chatham, gives I think a very good summary of the general opinion of the use of high explosive shell as an auxiliary to the fire of field guns. "Against troops in the open high explosive shell do not, and can never be expected to equal good time shrapnel, in which control can be exercised over the direction, force and size of the bullets, which is not possible over the pieces of a high explosive shell. Howitzer fire of shrapnel with its high angle of descent and low velocity is of little value for any purpose. Thus the high angle fire of high explosive shell, though it can well supplement, can never replace the direct fire of field guns."

Then, gentlemen, the Lecturer has shown us a contrivance by means of which the Germans can use their tangent scales and fuzes at the same reading in yards. I

do not see that it is simpler, or more easily managed, than our own system of having a different notation for tangent scale and fuze and it does not appear to be applicable to clinometer elevation, of which the German artillery make considerable use.

We have had a good many statistics given us of the effect of long range infantry fire upon artillery. The following details of an experiment carried out at Lydd in July 1894, showing the relative power of field guns and rifles at long ranges, may be interesting:—

Target, a field redoubt, 25 dummies were placed on the banquette with their heads showing over the top of the parapet, 25 dummies behind the rear casemate, range 1050 yards, number of bullets 5000.

This was fired at by 200 infantry with Lee-Metford rifles; ranging volleys were carefully fired by sections. The general results of these volleys could be fairly well seen by the dust thrown up by the shingle where the bullets struck. Result 49 hits on 24 dummies. The same target was attacked by a 12-pr. B.L. gun firing a 15 lb. experimental shrapnel shell with time and percussion fuze. The shell being experimental, the officer in charge of the experiment had no range-table nor had he a fuze scale, therefore many of his rounds were used in ranging. Range 1850 yards, rounds 20, giving a total of 2200 bullets. Result 26 hits on 17 dummies. The infantry fire was most deliberate and took an hour. The artillery fire too was slow and took 15 minutes.

Tabulating these results we find—

Range about	2 : 1	in favour of the artillery.
Time ,,	4 : 1	,, ,, ,,
Personal ,,	20 : 1	,, ,, ,,
No. of bullets	2 : 1	,, ,, ,,
Hits	1 : 2	,, ,, ,,

Now multiplying these ratios together, as you do to get the resultant of a combined system of mechanical appliances, we get an advantage of 160 : 1 in favour of the field gun (laughter and applause).

Colonel G. H. Marshall.—Gentlemen, the Lecturer, in speaking of the Germans, said great stress is always laid upon keeping the whole of the enemy's troops under fire, for it is considered that the effect of the enemy's fire decreases 50 per cent directly the soldier hears bullets whistling about his own head. This calculation must be of course a surmise; but granting it is true I would like to know what is the result. I think it comes under the head again of what Captain Headlam mentioned; it is merely another form of cover. If a General orders his artillery to come into action he wishes for some effect; he wishes either the enemy's guns to be silenced, or for some crushing concentrated effect upon the enemy's infantry; I do not think he would be satisfied if he found his artillery frittering away their fire and that they were quite satisfied because they were receiving 50 per cent less damage. I had hoped that this question had been finally settled. Many of us will recollect the very interesting discussion which took place in this room between an officer who was an exponent of the German ideas and the General Officer now commanding this district.

The Lecturer has put it to us to decide whether we do not spend too much time on "spit and polish." We know that the words "spit and polish" are used by many people as a term of reproach, meaning that the soldier is devoting too much time to the appearance of his arms, accoutrements and horses. In this matter I think that the soldier should not be judged differently from the civilian. If your coachman brings your carriage and horses to your door with your horses badly groomed and everything slovenly turned out you do not commend him or raise his wages; you probably get rid of him as careless and inefficient. Many batteries come under me every year at Okehampton, my experience is that in a

battery where the officers and men are well dressed, the horses, harness and equipment smartly turned out, these are signs of energy and zeal in essentials as well and that such a battery will also excel in drill, manœuvring and shooting.

REPLY.

CAPTAIN PILCHER.—Gentlemen the first question that Major May asked was about the premature burst of the high explosive shell. In every brigade division in Germany one battery has new pattern guns. I think the pattern is 1892. These guns are made of some peculiar new steel and the high explosive shell bursting in the barrel will not damage the gun. The other batteries of that brigade division do all their firing with high explosive shell out of the guns of this battery. In war the other batteries will have to take their chance until they all get the new pattern gun. It is, however, considered that the chances of a shell bursting in the gun are so small that there really will not be a great deal of risk run. In firing high explosive shell they range with ordinary shrapnel, containing the smoke-making substance, which I have tried to describe and I am practically certain that they use the same fuze. The battery that is going to fire the high explosive shell first fires for itself with ordinary shrapnel shell and gets the exact length of fuze requisite. These experiments that I have spoken of were carried out with an ordinary field gun, not with a howitzer. It is only when they cannot get at troops with ordinary shrapnel that they fire high explosive shell. They acknowledge that the effect with ordinary shrapnel against troops in the open will be very much greater than with high explosive shell.

I have never seen artillery with an advanced-guard when the force has been less than a division.

With regard to the question of "How do infantry attack artillery?" I think there is only one answer, and that is that it must depend upon the ground. Certainly the very worst thing that could be done would be to advance in lines one behind the other, but surely against infantry fire the same rule holds good, for with an infantry bullet there is even a greater dangerous space than with the bullets in a shrapnel shell. The Germans carry 140 rounds, but I think I made a note of that just now.

CAPTAIN HEADLAM.—147 rounds I think. That is including the nine waggons.

CAPTAIN PILCHER.—Yes, and the case too. I purposely did not include case.

CAPTAIN HEADLAM.—Yes, I think so.

CAPTAIN PILCHER.—In speaking of our batteries, Captain Headlam should, I think, have said, when contemplated alterations, have been carry out our batteries *will* carry 146 shell; there is great difference between the present tense and the future, Captain Headlam in speaking of our equipment has spoken of what *will be*, I have only spoken of what *is*. I have never heard the Germans speak of the *richt-bogen* and *richt-fläche* as being complicated, they certainly did not take long using them. The *richt-bogen* is an instrument they invariably use.

CAPTAIN HEADLAM.—I did not say a word against that.

CAPTAIN PILCHER.—The *richt-fläche* in not really used very often. I quoted an instance, but I said afterwards that the ordinary mode of procedure was with a couple of rods. It is all very well to talk about training your men to imagine that they are going to be shot to pieces and teaching them to expose themselves; but if the men do expose themselves unnecessarily and are all shot, there will not be any left to fight. There are many occasions when we *must* all expose ourselves, but we should not do so unless it is impossible to obtain equally good results from under cover. It must also be borne in mind that troops firing from under cover will be firing under what are comparatively peace conditions and this will

make a great difference in the accuracy and effect of their fire.

To make good use of ground and to get good results from indirect fire is difficult; to come on to a crest (in peace) and to fire directly is easy. Practice the more difficult the easier part will come of itself.

With reference to tiers of fire I have been asked whether it was at manœuvres that I saw them employed. Yes, it was at manœuvres and I saw them placed in the same way as they would be placed in battle. I do not see why artillery should be afraid to fire over their own heads, when it is regarded as a matter of course that they will fire over the heads of infantry. I asked a question the other day respecting tiers of fire, and the officer whom I mentioned just now kindly sent me the following notes, he says, "In artillery positions the first thing is effect; cover is of secondary importance. The configuration of the ground must determine these points. We use tiers of fire, when the ground allows it, in order to decrease the effect of the hostile artillery fire. We wish to oblige the enemy to range on every single battery. The control of fire must however remain in the hands of one man, and on account of the effect of fire, intervals and distances should not be diminished. It is seldom that ground fulfils all the conditions necessary to enable us to use tiers of fire."

I was much interested just now when Major Sclater said something about Glenbeigh. Captain Crampton very kindly showed me a valuable report he is drawing up upon this subject; but in it he did not seem to give credit to infantry for firing quickly enough. He calculated the amount of weight of metal which infantry would fire within a certain time, the infantry occupying a certain frontage. He calculated that a man would fire about one and a half rounds a minute. Infantry can very comfortably, without hurrying themselves the least bit, fire $3\frac{1}{2}$ to 4 rounds a minute.

Major Sclater.—There is no doubt that you cannot make a mechanical comparison there. It is a broad line that is drawn, and that is all you can do.

Captain Pilcher.—With regard to what Lieut.-Colonel Rainsford-Hannay has said about the experiments at Lydd the 200 infantry could have fired the 2200 rounds comfortably in $2\frac{1}{2}$ to 3 minutes instead of taking an hour over it, and this would make a difference in his mathematical conclusion.

As to what has been said about concentrating fire, first on one battery and then on another, this is a subject I have spoken about often in Germany, and the argument they use is that human nature must be taken into consideration, and that the instinct of men is to fire back at those who are firing at them. It is of course easy in peace to say you are not going to do this, but in war it is very different. Human nature is a thing you cannot legislate for, to attempt the impossible is to court defeat, besides which, to follow the course above indicated unless you are very superior in numbers or are much favoured by the shape of the ground, would be to allow part of the enemy's force to fire at you under peace conditions.

I think, Gentlemen, I have now replied to all the questions that have been put.

The Chairman.—I think gentlemen you will all agree with me that we have listened to a most interesting lecture and discussion; and although the discussion has travelled over a wide ground and has embraced many topics, I do not intend to refer to all of them. But there are two or three which seem to me to be interesting, some of which have not been noticed. And first and foremost I should like to refer to the point the Lecturer began with, which I believe is really almost of the greatest importance, and that is the question of the knowledge of ground. It is one of the greatest drawbacks to military training that we have in England, probably, because of the great difficulty with which our manœuvres are carried on, and of the very great difficulty we have in getting any sort of available ground on

which we can properly conduct the manœuvres, that we have not, I think, sufficiently paid attention to the enormous importance of the study of ground. I do not mean in relation to the large pieces of ground, or the question of fields and valleys, but the question of undulation; and in that very question of undulation is to be found I believe the answer to the question that was asked as to how we should best attack artillery. I believe there is hardly any position that the artillery could take up that could not be approached almost with impunity, by a comparatively small force sufficient at any rate to very seriously damage the artillery when they got near them, if there was not some corps or some scouts a considerable distance from the artillery watching it, and I am sure any officer who has studied the extraordinary effects of ground and has stooped and paid attention to the varied formation and characteristics of the surface will some day make his mark when he puts the result of his study into practice.

And then with regard to that point that the Lecturer mentioned about the insistance of the Germans that the commanding officers should separate themselves from their command, that is the old question of where the officer commanding the Horse Artillery should be, when the Horse Artillery are acting with cavalry; and I know very well that many officers think that he should be always with the battery, but it has been decided now the other way. At any rate the advantage of his being away from the battery is that he has much more power and much more time to select his ground for the artillery than he would otherwise have; and exactly the same remark holds good with officers holding commands of regiments. I have never seen a battalion commander far enough, in my opinion, in front of his battalion when manœuvring. I hope when we do get more ground, or more facilities for holding manœuvres, it will be one of the first lessons we shall try to teach that the commanding officer should separate himself from the details and duties of command and take general charge of his unit.

Then the question of the advance-guard battery has been mooted. But surely that must be a question of what your advance-guard has got to do; and the composition of the advance-guard must entirely depend upon the duties it is called upon to perform. The general argument would be that, as a rule, with a small force you ought to keep your artillery behind the advance-guards. As for machine guns, for my part I think in this theatre, at all events, we may leave that subject by saying that I do not think the artillery arm of the service has anything to fear from any great advance made by the machine guns.

The question of the value that is to be obtained from infantry and artillery fire I think again must be left to the discretion of those upon whom the duties fall.

Then the Lecturer has made a great point of the Germans and their high explosive. I certainly thought that they had not got a high explosive for their field gun. As far as our experiments have gone the advantage that is gained by putting high explosives into a shell of small calibre is so very small and the danger on account of the fuzes and so forth is so great that up to this time we have not dared to undertake it; and I believe myself that the Germans are in exactly the same state.

Having made these observations, gentlemen, I will ask you all to join with me in thanking Captain Pilcher for the lecture he has delivered this evening, which has been most instructive and most interesting (cheers).

FRANCOIS DE LA ROCHEFOUCAULD, MARQUIS DE MONTANDRE,[1]

MASTER-GENERAL OF THE ORDNANCE IN IRELAND AND A BRITISH FIELD-MARSHAL, 1739.

BY

CHARLES DALTON, ESQ.

Editor of English Army Lists and Commission Registers, 1661–1714.

"He was esteemed by all the princes under whom he had the honour to serve, and well beloved by everybody that knew him."—*London Daily Post*, August 16th, 1739.

Special interest attaches to this Field-Marshal from the fact of his being a Frenchman by birth and descent. Of ancient lineage—a scion of a house whose nobility dates from the 10th century—honourable character, and endowed with military ardour, François de la Rochefoucauld was well fitted to hold high rank in the French army, but the short-sighted policy of "Le Grand Monarque" drove the subject of this memoir, with many brave compatriots, into the service of France's most bitter foe, William III., King of England.

Francis, 1st Count de la Rochefoucauld, was Prince of Marsillac, Lord of Barbezieux, of Mont Guyon, of Montandre, and Chamberlain of Kings Charles VIII. and Louis XII. He died in 1516 or 1517, leaving a younger son, Louis Seigneur de Montandre, who was great-great-grandfather of our Field-Marshal who was born in September 1672. "He appears," says Colonel Chester, "to have been bred a Canon in the Abbey of St. Victor at Paris, but fled to England on account of the change in his religious sentiments." The young Huguenot refugee probably served as a volunteer in King William's army in Ireland[2] prior to his being appointed Captain and Brevet-

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[1] A very full memoir of the Marquis de Montandre is to be found in Mr. Agnew's *Protestant Exiles from France* (three vols.), published in 1871–4; biographical notices in La Haag's *La France Protestante* and Colonel Chester's *Westminster Abbey Registers*. Letters and *MS.* references in *Treasury Papers* and *State Papers* at Public Record Office; newspapers and contemporary diaries, etc.; Boyer's *Annals of Reign of Queen Anne;* Captain George Carleton's *Memoirs;* Walpole's *Letters;* Cannon's *Regimental Records; The Marlborough Despatches;* Walpole's *Letters to Miss Berry* (edited by Lady Theresa Lewis), Vol. I.; Parnell's *War of the Succession in Spain.*

[2] An obituary notice of the Marquis de Montandre in the *London Daily Post*, August 16th, 1739, says: "He made all the campaigns in Ireland and Flanders under William III."

Lieut.-Colonel in Colonel François du Cambon's Regiment of Foot. His first two commissions are thus officially entered in the War Office *MS.* Commission books:—

> "Francis de Montandre, Esq. to be Captain of a company whereof Lieut.-Colonel James Montant was Captain in Colonel Francis de Cambon's Regiment of Foot, dated 15th February, $169\frac{2}{3}$."
>
> "Brevet for Francis de Montandre, Esq. to command and take his rank as Lieut.-Colonel of Foot, dated Kensington, 15th February, $169\frac{2}{3}$."

It would seem from these commissions that the future Field-Marshal dropped his surname of Rochefoucauld on entering the British army and adopted in its place the name of his father's marquisate. In 1702, on the death of his elder brother, Isaac Charles, third Marquis, he assumed the title of Marquis de Montandre by which he was henceforth known.

In August 1692, Cambon's Regiment, which had done good service in Ireland, sailed for Flanders with 14 other regiments and arrived at Ostend 1st September. On the death of Colonel Cambon in this year the regiment was given to Count Marton, afterwards created Earl of Lifford, and served with King William in all his campaigns in Flanders until the Peace of Ryswick. We have no record of Montandre's services during this period, but from the following curious notices in several contemporary London newspapers it appears that 16 French Protestant officers, and six men, of Colonel Cambon's Regiment were taken prisoners by a French ship when on their way to England and carried to Dunkirk, where they suffered great privations.

> *Post-Boy,* March 18th–20th, 1697.—"I am credibly informed that Sir W^{m} Jennings,[1] who is now with King James in France, has writ a letter to a Person that is in a considerable position in the Government offering for Mr. Jennings, his son, who has been a long time in Newgate under sentence of death, to discharge 16 French Protestant officers and six soldiers of Colonel Cambon's Regiment, who were taken on their voyage from Flanders to England and carried to Dunkirk, and I hear the same was readily agreed to and that Mr. Jennings was to be sent over to France forthwith in exchange for these prisoners."
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> *Post-Man,* January 30th.—"There is advice that the French Protestant officers who are prisoners in Dunkirk have been forced to cast lots who should go to the gallies, the French King having ordered it so to gratify the vengeance of a certain abdicated Prince."

In 1698 Lord Lifford's, late Cambon's, Regiment was quartered in

[1] A captain in the navy who accompanied James II. into France. His son was captured on board a French privateer fighting against his own countrymen, was brought to England, tried and condemned to death. We read in the *Post Boy* of July 22nd, 1699, that "Mr. Jennings, having obtained His Majesty's most gracious pardon, pleaded the same at Doctors Commons according to custom."

Ireland and from a list of the regiment in that year, still extant, we find that François de Montandre was the acting Lieut.-Colonel. Four years later we find him receiving a pension of £200 a year upon the Irish Establishment.

In 1703 Portugal joined the "Grand Alliance" against France. An Anglo-Dutch force was sent to Lisbon commanded by the Duke of Schomberg, whose father had liberated Portugal from the Spanish yoke, but the Duke was superseded in the following spring by the Earl of Galway, who, like Cincinnatus of old, left his retirement and the planting of cabbages to fight the battles of his adopted country. Some months prior to this command being thrust upon the gallant veteran, Henry Massue de Ruvigny, Earl of Galway, we find this nobleman soliciting some appointment for the Marquis de Montandre at the hands of the great Marlborough. The latter commander had not the power just then to accede to Galway's request, but he expressed his esteem for Colonel de Montandre.[1] One of the first officers chosen by Galway to serve on his own staff, when he was selected for the Portuguese command, was our Huguenot Marquis, who was promoted Brigadier-General on the British Establishment. The military operations in Portugal in the autumn of 1704 are not worth detailing. In the following spring the allies under Lord Galway, Count Fagel and the Comte de Corzana marched to the frontier and laid siege to Valencia de Alcantara. "In all our march," wrote an officer in Galway's army from the camp before Valencia, May 2nd, 1705, "we met nobody in arms nor can we learn what has become of the Spanish cavalry—a feint my Lord Galway made by sending to view Badajoz has, 'tis said, drawn them that way. I suppose 'twill not be long before we hear of them, for if they let Alcantara fall into our hands, if we can get provisions, nothing can hinder our piercing much further into Spain. My Lord Galway, who is not perfectly recovered of his late sickness yet, is the soul of this matter here, and if he does not do the work on this side, any other man will find it impossible." Valencia surrendered and the towns of Salvaterra and Albuquerque were successively besieged and taken. After these slight successes the allies went into summer quarters. In October they again took the field. *The London Gazette* of October 18th, 1705, gives the following official account of the siege of Badajoz where the Marquis de Montandre did good service :—

> "The confederate forces being all joined on the 1st inst. near the Caya, the Earl of Galway marched with them, the next day passed that river, the Xevera, and the Guadiana, and encamped before Badajoz, where the forces lay all night upon their arms. The 3rd they took post before the town. The 4th, at night, the trenches were opened and the Marquis de Montandre, who commanded as Major-General that week,

[1] Murray's *Marlborough Despatches*, Vol. I., p. 183.

did very good service and they are already carried forward within less than 100 paces of the town which has no outworks."

The siege was carried on with great vigour until Lord Galway was severely wounded—his hand being struck off by a cannon ball which necessitated the amputation of his right arm. The leading spirit of the army being incapacitated from serving for some time the entire command devolved on Count Fagel, General of the Dutch troops, and the Marquis des Minas, General of the Portuguese and Generalissimo of the allied forces. They were out-generalled and out-manœuvred by the French Marshal, Tessé, who succeeded in throwing 1000 men into Badajoz. The siege was raised and on October 17th the allies began their retreat. Marshal Tessé followed them with part of his army, "but the march of the confederate forces being covered by the Marquis de Montandre with six battalions and eight squadrons, they drew off in very good order without any loss . . . . On arrival at Elvas the army separated and went into winter quarters."

The following spring found the veteran Earl of Galway once more in the field and eager to march with the allied troops into Spain and join forces with the Earl of Peterborough. But, as before, his actions were hampered by the vacillating councils of the Portuguese Generals who were in favour of a defensive war in their own country rather than an offensive campaign in Spain. The old saying that "every cock crows on his own dunghill" was strongly exemplified in the case of the Portuguese officers, whether taken as a body or individually. They were willing, and more than willing, to serve with the British and Dutch troops, for had not England and Holland engaged themselves by treaty to pay 13,000 Portuguese soldiers while the war lasted, and were not England and Holland better paymasters than His Majesty the King of Portugal? But they hoped to acquire a maximum of glory at a minimum of risk and also at a minimum of discomfort. After several councils of war had been held it was decided to march to the frontier and besiege Alcantara. The allies arrived in front of this place early in April, and on the first night of their arrival 800 sappers were employed in raising earthworks and digging a trench deep enough to cover the troops. "The Marquis de Montandre," we are told, "sustained the workmen with five battalions of foot and 200 horse." The French kept up a brisk fire all night and next day made a vigorous sally. Being repulsed with loss, the enemy surrendered the town on April 14th and the allies were left in possession.

Lord Galway took advantage of this success to again press the question of a march to Madrid. Lord Peterborough sent pressing messages: "Come over and help us," was the continual cry from the Carlists and their allies in Spain. Barcelona was besieged by a large French army under Marshal Tessé and invested on the sea-board by a fleet of 30 French ships. Peterborough had his hands full in Catalonia. Charles III. was shut up in the beleaguered town. Never was there

more need of a "war of diversion" and never was there a better opportunity for it. The road to Madrid from Alcantara lay open to the Portuguese army who outnumbered four to one the force under the Duke of Berwick—Philip the Fifth's best General. Madrid could not offer any prolonged resistance. The capital, once gained, might be held until Barcelona was relieved by the expected English fleet, when Peterborough's army could bring Charles III. in triumph to his capital. So eager were Galway and the English officers to march on Madrid that the former agreed to the Portuguese troops taking the right on all occasions in Spain which before had only been acceded to them when in their own country. This important concession, for which Galway was afterwards blamed by the House of Lords, induced the Portuguese Generals to march into Spain. On arriving at Almaraz, half way between the frontier and Toledo, these half-hearted allies determined to proceed no further eastward until more reassuring news was received from Barcelona. The invading army turned northward and laid siege to Ciudad Rodrigo, capturing two Spanish towns on the march thither. It is recorded by Boyer that "these two towns declared for King Charles because communication with their ice houses was cut off!" When the allies arrived before Ciudad Rodrigo Montandre was commanded, with five battalions and some cavalry, to possess himself of the mountain pass called Robredillo and so prevent a relieving force being thrown into the invested town which capitulated in seven days. The very day that this happened news arrived that Barcelona was relieved. Once more did Galway press the necessity of the march upon Madrid and, on 3rd June, the allies began their march to the capital which they reached on June 29th, a few days after Philip, titular King of Spain, had fled from it. The allies wasted a whole month at Madrid in inaction. Well might Lord Peterborough say that this halt was as fatal as Hannibal at Capua.

The Marquis de Montandre was despatched by Lord Galway from Spain to give a relation to Queen Anne of the affairs that had taken place in that country. While in England he wrote a memorial to the Lord High Treasurer of England to the effect that, as he had a Major-General's command in Portugal, he begged to be promoted to that rank in the British army. In this memorial he thanks for the promise that had been made him of the Colonelcy of the first English regiment that might become vacant. As a reward for his eminent services in Portugal and Spain he was promoted Major-General, his commission being ante-dated to June 1st, 1706. In November of this year Montandre left London for Spain to rejoin Lord Galway. He received a handsome present from Queen Anne and was instructed to urge upon Lord Galway to continue in his high command in Spain.

On 8th November Viscount Dungannon, Colonel of an English regiment, died at Alicante, and on the news reaching London the Marquis de Montandre was given the vacant regiment, his commission as Colonel being dated 23rd November, 1706.

Captain Carleton in his graphic memoirs, says:—"The Marquis de Montandre lost the regiment before he had possession,

by an action as odd as it was scandalous.[1] That regiment had received orders to march to the Lord Galway's camp under the command of their Lieut.-Colonel, Bateman, a person before reputed a good officer, tho' his conduct here gave people, not invidious, too much reason to call it in question. On his march he was so very careless and negligent . . . . that his soldiers marched with their musquets slung at their backs and went one after another (as necessity had forced us to do in Scotland), himself at the head of them in his chaise, riding a considerable way before." "It happened there was a Captain with three score dragoons, detached from the Duke of Berwick's camp, with a design to intercept some cash that was ordered to be sent to Lord Galway's army from Alicant. This detachment, missing of that intended prize, was returning very disconsolately, *re infecta*, when their Captain, observing that careless and disorderly march of the English, resolved, boldly enough, to attack them in the wood. To this purpose he secreted his little party behind a great barn, and so soon as they were half passed by he fell upon them in the centre with his dragoons, cutting and slashing at such a violent rate that he soon dispersed the whole regiment, leaving many dead and wounded upon the spot. The three colours were taken and the gallant Lieut.-Colonel taken out of his chaise and carried away prisoner with many others; only one officer, who was an ensign and so bold as to do his duty, was killed."

The narrator of this inglorious episode goes on to say that the Duke of Berwick turned pale when he was told that a whole British regiment had been taken prisoners by a troop of Spanish cavalry. He declined to see the colours which were being exhibited in his camp, and when Colonel Bateman was brought before him the Duke, who was at heart a Briton, tho' in arms against his own countrymen, merely said, "you seem to have been very strangely taken, sir," and then took no further notice of the crestfallen commander. There is such a thing as "the curse of a granted prayer," and the Marquis de Montandre must have felt this when he heard of what had befallen his new regiment which he was not destined to see for several years.

Although Montandre rejoined the Earl of Galway in Spain, he does not appear to have been present at the fatal battle of Almanza. It is probable that after delivering Queen Anne's instructions and wishes to Lord Galway the Marquis was despatched to Portugal, to take up his divisional command there. We find him at Lisbon the first week in June 1707, when four British infantry regiments landed there from Ireland and marched under his command to the frontier. This timely reinforcement revived the drooping spirits of the Portuguese and gave

[1] Carleton's story is entirely corroborated by the account given in the *Post-Man* of April 29th, 1707.

a check to the enemy who had marched into Portugal with a view to besiege Olivenza, or oblige the Portuguese to give them battle.

The reduced condition of the allied forces in Portugal, owing to the fact of the veteran troops being in Spain with Lord Galway, did not allow of any offensive operations on the part of our forces, but in March 1708, Galway returned to Lisbon and by his representations Queen Anne determined to increase the strength of the allied forces in Portugal. Six dragoon regiments were ordered to be raised and equipped in Portugal at Her Majesty's expense who reserved the right of appointing the officers to the said regiments. It was decided to appoint Huguenot officers to these cavalry regiments, and the Marquis de Montandre was one of the first officers chosen for command of a regiment. A *MS.* list of Montandre's regiment, dated July 14th, 1708, is still extant, but owing to many delays, partly caused by the King of Portugal objecting to have any of his regiments commanded by French Protestant officers, these new regiments were not embodied until the following summer, when we find this notice in a London chronicle :—

> *Post-Boy*, April 9th, 1709.—"The French officers and others who are to serve in the five (*sic*) Portuguese regiments in Her Majesty's pay that are raising in Portugal, having received four months' pay, began yesterday, according to their orders, to set out for Portsmouth in order to embark there. Four of the Colonels are to be Portuguese, the fifth the Marquis de Montandre."

In the spring of 1709, viz. on May 7th, was fought the battle of the Caya. For once in their lives the Portuguese were anxious to bring on a general action and try their strength with the Franco-Spanish force commanded by the Marquis de Bay. Lord Galway, knowing the instability of his Portuguese allies, was averse to their opening the ball and advised a defensive, rather than an offensive, course. But the Marquis de Fronteira, who commanded as Generalissimo, persisted in the contrary resolution. Accordingly the Portuguese cavalry and artillery, with a British infantry brigade, consisting of the 5th, 20th, 39th and Lord Paston's regiments, commanded by the Marquis de Montandre, crossed the river Caya, and gaining the opposite heights opened fire on the enemy. The Marquis de Bay, who commanded the Spanish army, being very advantageously posted, lost no time in leading a cavalry charge against Fronteira's right wing composed of Portuguese horse. These latter wheeled round and fled *ventres à terre* without waiting to be attacked, leaving their artillery to be captured. Montandre's brigade was then attacked, but this General made a most determined stand and repulsed three charges. Galway lost no time in coming to Montandre's assistance with the remaining British infantry brigade, commanded by Major-General Sankey and supported by the Portuguese cavalry of Fronteira's left wing. Sankey's brigade (Barrymore's, Stanwix's and Galway's regiments) retook the captured guns with a rush, but meanwhile the cavalry of the left wing had

followed the example of the right and had bolted. Sankey's brigade being far in advance were isolated and cut off from the other British regiments, and being surrounded by Bay's cavalry had to surrender as prisoners of war.[1] Montandre retreated in square, and though exposed to the enemy's fire on both flanks as well as in front, he made such bold stands and charges that the whole of the Portuguese infantry, who had never come to the front at all, were able to secure their retreat to Arronches. Montandre lost only 150 men and inflicted a heavy loss on the Spaniards.

The *Monthly Mercury* for May, 1709, gives a glowing description of the bravery shown by Montandre's little band in their retreat—"exhibiting one of the most noble spectacles of war." Galway had a horse shot under him and barely escaped capture. The allies encamped that night at Arronches and next day reached Elvas, where they took up a strong position which Bay was wise enough not to try and force. So ended the spring campaign—the last in which Montandre took a part. On September 29th, 1709, he arrived in London to give the Queen a report of affairs in Portugal and, for reasons which are not specified, Montandre relinquished his command.

On April 21st, 1710, Montandre was married at St. James', Westminster, to Mary Anne, daughter, and only surviving child, of Ezekiel Baron Spanheim, Prussian Ambassador at the Court of St. James.[2] On the 9th May following he was promoted a Lieut.-General in Her Majesty's service. At the close of this year, or early in 1711, the shattered remnants of Montandre's English regiment, which had been taken prisoners in the spring of 1707 by the Spaniards, arrived at Portsmouth, where it was recruited. Not only had the Marquis gained no advantage by the Colonelcy of this regiment, but he was a considerable loser thereby. The regiment had to be re-clothed and the Colonel, whose business it was to provide the money for this, out of his own allowances, had not received the "wherewithal" from the Government. "Out of sight out of mind" is a true saying, and Montandre's, late Dungannon's, regiment having been three and a half years imprisoned, had not received much notice from the authorities at home. Hence there were great arrears due to both officers and men when they arrived in England. There are several letters aud petitions from Montandre regarding his regiment and the arrears due him and his officers, among the Treasury papers. In 1713 this unlucky regiment was disbanded and there was an end to it.[3] But the arrears were not settled and petitions to the Lord High Treasury of England setting forth the grievances of the Colonel, and his late regiment, went on for some time after until much importunity partly

[1] General Sankey, Brigadiers Pearce and Lord Barrymore, and Colonel Meredith of Stanwix's regiment were among the prisoners.

[2] *Post-Man*, April 22nd, 1710.—"Yesterday the Marquis de Montandre of the family of the Duke de Rochefoucauld and chief of one of the branches thereof and Major General in Her Majesty's service was married to Mademoiselle de Spanheim, only daughter to His Excellency, the Baron de Spanheim, Ambassador Extraordinary of His Majesty the King of Prussia."

[3] *The Daily Courant*, April 22nd, 1713.—"Letters from Dublin of the 13th advise that four regiments on the Irish Establishment are to be broke on the 1st May, Pearce's, Morison's Dragoons, Deloraine's and Montandre's Foot."

opened the Treasury purse and a settlement of some sort was effected. As to Montandre's Dragoon Regiment in Portugal, it does not appear to have been embodied until the autumn, or winter, of 1709, as we find Lord Galway in the October of that year representing to the King of Portugal that his army could not act offensively until the men for the six dragoon regiments, in the pay of Great Britain, had been raised. Montandre was Colonel of the last of these six regiments and his name appears as Colonel in a list of the regiment under date of 23rd December, 1709. On his relinquishing his command in Portugal, Lieut.-Colonel Sarlande was appointed Colonel in Montandre's place.[1] These dragoon regiments were disbanded in 1711. His long connection with the British army made Montandre anxious to have, and to hold, the Colonelcy of a British regiment which would bear his name and place a certain amount of military patronage in his hands. As we have already seen, his own regiment was reduced after the Peace of Utrecht. On July 22nd, 1715, we find the Marquis de Montandre appointed Colonel of a newly raised regiment on the Irish Establishment, but, in 1718, this corps was reduced and the Marquis had once again to urge his claims for a regiment.[2] In 1719 we find him writing two letters to General Stanhope, Secretary of War, dated respectively 3rd June and 12th July, begging that General's interest in obtaining for him a regiment which had just become vacant by the death of its Colonel.[3] But *the* wish of Montandre's latter years remained ungratified. Other high honours were, however, in store for him and he found a friend in George II. On 16th January, 1728, Montandre was appointed Master-General of the Ordnance in Ireland[4] and was allowed in his later years to discharge this office by deputy. On October 27th, 1735, Montandre was promoted to the rank of General and three years later was appointed Governor of Guernsey with a salary of £1500 per annum. This latter appointment was also a "non-resident" one and allowed the Marquis to reside at his house in Brook Street, London. On the death of the Earl of Orkney, in 1737, it was announced in one or two of the London papers that Montandre had been raised to the Marshalate. That there was some ground for this rumour we may readily believe from the following extract out of a letter to the Duke of Ormonde, from his friend Mr. Ezekiel Hamilton :—

> Leyden, June 2nd, 1737.—"I hear that the Marquis de Montandre is to be made Field-Marshal, in the room of the late Earl of Orkney, which is not agreeable to many of the English General officers who were disgusted that fourteen foreigners were amongst the list of the last promotion of General officers in England."

[1] Mr. Agnew makes no mention of Montandre's Portuguese regiment.

[2] It is curious to read in Mr. Agnew's memoir of Montandre's services that "he maintained his regiment through the various administrations."

[3] The vacancies occurred by the deaths of Generals Meredith and Davenport, both of whom were Colonels of Regiments on the Irish Establishment.—*Stanhope Correspondence*, Record Office.

[4] The seal used by Montandre as Master General of the Ordnance in Ireland is in the possession of the Des Voeux family.

It was not till July 2nd, 1739, that the *London Gazette* contained the formal notice of Montandre's promotion to the Marshalate. The gallant veteran only lived until the 8th of the following month. His death and burial are thus chronicled in two contemporary London journals.

> Saturday, August 11th, 1739.—"Wednesday about 4 o'clock in the afternoon, aged near 70, of a complication of distempers, at his house in Great Brook Street, Grosvenor Square, the Marquis de Montandre, Field-Marshal of England, Governor of Guernsey, Master of the Ordnance in Ireland and General of Foot. He was a Peer of France and came over here on account of his religion. He married the daughter of Baron Spanheim, formerly Envoy from the King of Prussia, by whom he had no issue. His corpse is to be interred in a grand manner in Westminster by that of his father-in-law."[1]

> Saturday, August 18th, 1739.—"Wednesday the corpse of the Marquis de Montandre, after lying in state in the Jerusalem Chamber, was carried from thence and interred in great funeral pomp and solemnity with the remains of Baron Spanheim and his lady in a vault near King Henry VII.'s chapel, Westminster Abbey. The whole choir attended at the ceremony. The Right Hon. Sir Paul Methuen, Knight of the Bath, walked as chief mourner."[2]

The Marquis left no issue by his wife, who survived him many years. She was a well-known figure in London society and on more than one occasion entertained Royalty. The Marquis having only enjoyed the emolument from his Governorship of the island of Guernsey for one year, George II. was pleased to allow the Marquise to remain in possession of the salary from Guernsey for one year more. Various anecdotes concerning this lady will be found in the diaries and correspondence of the period. One of these anecdotes is worthy of being re-told. "I remember," wrote Walpole to Miss Berry, from Strawberry Hill, July 4th, 1791, "an old French refugee here, the Marquise de Montandre (the Mademoiselle Spanheim of the Spectator) who, on the strength of her pinchbeck Marquisat,[3] pretended to supersede our sterling countesses; but being sure of its not being allowed she thus entered her claim. When at a visit, tea was brought in; before the groom of the chambers could offer it to anybody, she called out, 'I would not have any tea;' and then, when she had thus saved her dignity, she said to him, after others had been served, 'I have bethought myself, I think I will have one cup.'"

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[1] *Read's Weekly Journal.*

[2] *Ibid.*—Sir Paul Methuen was for some years British Ambassador at Lisbon.

[3] This remark was not so ill-natured as it would appear at first reading. By French law a title reverts on the death of the eldest son without issue male to his youngest brother. On the death of Isaac Charles Marquis de Montandre in 1702 the heir, by French law, was not Francis de Montandre, but his younger brother.

The witty, but sceptical, Lord Hervey makes passing mention of the Marquis de Montandre and his wife in his poetical epistle, written in 1736 and addressed to the Queen :—

> "Who ev'ry Wednesday hear Montandre prate
> Of politics and maxims out of date,
> And with old fringes furbelow the State.
> As well that Ever Green his wife might boast
> The long fled bloom of a last century toast."

Being himself an unbeliever, Lord Hervey despised all Huguenot refugees whom he stigmatised as "having more religion than sense," and he never lost an opportunity of sneering at them.

The Right Hon. Mary Ann, Marchioness of Montandre, died at her house in Lower Brook Street on February 5th, 1772, aged 89, and was buried on February 18th in Westminster Abbey.

AMMUNITION COLUMNS AND PARKS, CONSIDERED WITH REFERENCE TO THE REPLACEMENT OF AMMUNITION, HORSES AND MEN DURING AND AFTER AN ACTION.

BY

CAPTAIN J. F. CADELL, R.A.

"VIGILENTIA NON CADET."

DUNCAN GOLD MEDAL PRIZE ESSAY, 1896.

Introduction

To most questions which may be asked on any military subject we can turn for an answer to the experiences of many wars for some analogous cases; from these deductions may be formed, which should be correct if we can judge rightly as to which side is supported by the weight of evidence, and at the same time see clearly what were the local circumstances of the time causing success or failure. In the present case we have little or no experience in war to refer to, since the Ammunition Columns and Parks as at present constituted are altogether new inventions, called into existence to meet the difficulty which has arisen in supplying troops expending the enormous quantities of ammunition that are now-a-days used in a very short time. These troops would be unserviceable without a fresh supply of ammunition, and it is therefore necessary to have a reserve supply immediately to hand. Like everything else in war, the more highly organized this supply is the better. Experience in war does show us that troops well supplied with ammunition have a decided moral and physical advantage over troops less well supplied, but as to how the ammunition from the new Columns and Parks is to be supplied to troops during and after an engagement it is silent. Our own wars have not been on a sufficiently large scale to allow of an Ammunition Column being employed and the cause of the existence of these columns is the result of the want which was felt in 1870–71.

Expenditure of Ammunition and duration of battles.

The fact that a gun may fire 160 to 180 rounds in a single day's fighting shows that if the gun and wagon taken into action can only carry 110 rounds, the supply is insufficient. Although the average expenditure may be taken at a much lower figure, say 30 to 50 rounds for each day's fighting, a fear has sprung up that the battles of the future will not always be fought out in one day, and that an action which is temporarily stopped by nightfall may be resumed on the following morning. Whether this is a fear which will be found to be grounded or not is another question, we personally believe that men are either victorious or beaten in one day, and that nightfall will, in 99 cases out of 100, tell sufficiently on the nerves of the men to make the two or three days' battle less likely with arms of precision than it was in days of less dangerous weapons, and we rather doubt the experience of the citizen wars of America being true lines to go upon, and battles such as the Lisaine cannot be considered typical from any point of view. Be this as it may, it will be an evident advantage to an army to always have ammunition to hand. With satisfactory Ammunition Columns no one could find any sufficient reason for Bazaine not continuing his retreat on Verdun on the 17th August, 1870.

Ammunition Columns and Parks generally.

Ammunition Columns and Parks, which are the latest additions to modern armies, have now become an integral part of our army on paper and as far as carts, harness and stores are concerned a certain number of Ammunition Columns exist in substance. The Parks appear to be still purely paper organizations, and as such even are not very complete in mobilization details.

Experience gained by experiments.

We have had some experimental practice with an Ammunition Column with borrowed horses and men at Aldershot, and have tested a battery at Okehampton as to its capabilities for firing away a certain amount of ammunition in a day, that ammunition being brought up, as it would be from the rear, by a portion of an Ammunition Column. Both these experiments were satisfactory as far as they went, but they tell us very little of what would happen in war as regards the large question we are now treating.

Facts as regards supply

There are some things which are established facts, and the two important ones for our purpose are that an infantry soldier will fire more rounds than he can carry into action, namely 100, in a very short time, and that a gun may fire more than 110 rounds in an action. It is obviously most essential that fire effect should never be lost by troops well placed or in danger, from the fact of wanting ammunition. The infantry soldier is in some respects better off than the gun, because he has a regimental reserve of 85 rounds per man carried regimentally, but his expenditure in exposed positions is almost without limit. The supply of the infantry soldier in the fighting line is, however, not our business. It is a task that has baffled many deep-thinking soldiers, it is at present arranged for regimentally, and must of necessity be done in this manner. The Ammunition Column only comes in as a supply to the regimental reserve in every case, for in the artillery the wagons may be treated as a 1st reserve to the gun and limber, although they often may be emptied first.

Distribution of Ammunition Columns and Parks.

In large wars, where large masses of troops will be engaged, we have arranged that with the army there shall be an Ammunition Column to each division and one to the corps troops of each army corps while there is also one to each cavalry brigade. There are at present the nuclei of four Cavalry Brigade Ammunition Columns, nine Division Ammunition Columns, and three Corps Troops Ammunition Columns. These Ammunition Columns, which form the 2nd reserve of ammunition, carry 77 rounds per rifle, and 74 per gun and 24 per pistol in the army corps, and a reserve of 20 rounds per carbine to the cavalry attached to the divisions. Behind these there marches after each army corps a 3rd reserve of ammunition, which is called the Ammunition Park; this is divided into five sections, the first three being for the supply of the three divisions, the 4th for the corps troops and the 5th for the cavalry brigade. The Ammunition Park carries 60 rounds per rifle, and 72 rounds per gun in the army corps.

Principle given for supply.

The general principle which is laid down for the supply of ammunition in the field is that the firing man or gun is supplied by the 1st or regimental reserve as far as possible at the beginning of an action, so that they may be able to retain their personal supply intact as long as possible. This 1st reserve is for the infantry, the regimental small-arm ammunition carts and mules, for the artillery, the battery ammunition wagons, for cavalry the regimental ammunition wagons. As soon as this reserve has expended any ammunition it should supply the loss from the Ammunition Columns, these in turn obtaining what they expend from the Ammunition Park. The Ammunition Park will be kept full from the Ordnance Store Depôt, which will in all European countries be closely connected with some railway.

Positions of Ammunition Columns and Parks generally.

The next point which we must notice is one which is stated in our regulations, or perhaps more correctly in the books that are printed for the instruction of officers; it is that the Ammunition Columns move a mile or so behind the divisions or army corps, and the Ammunition Park nearly a day's march behind these, say about nine or ten miles. As to how the supply is to be actually carried out these books are silent, probably for the very good reason that there is no experience to guide them, and that in the ever varying conditions of war there are so many possibilities that it is better to trust to the common sense and initiative of the men on the spot, than to hamper them with orders which it would probably be impossible to execute, and which might be the very worst for the actual case in point.

What is to be done generally.

The first principle of supply which we have stated is clear enough. The fighting unit must have full pouches and boxes, the 1st reserve must see to this, while each reserve in rear supplies the deficiencies of those in front. There is no hidden secret as to how this is to be managed, but clear heads will be necessary to prevent waste of force, and what is equally important, waste of time.

Constitution of Ammunition Columns and Parks.

Having thus emphasised the general duties of the Ammunition Columns and Parks, it may be well to give in the form of a table their constitution, and also to state what they carry, before we go into the details of supply in the field. This will, to a certain extent, help us to show what they will have to supply and what they will probably have to send away during an action.

TABLE A.

Ammunition Columns.

Ranks.	"Personnel."			Horses.					
	Inft. Div.	Corps Troops.	Cav. Brig.	Inft. Div.		Corps Troops.		Cav. Brig.	
				R	D	R	D	R	D
Majors	1	1	1	2[1]	...	2[1]	...	2[1]	...
Lieutenants	3	3	2	3	...	3	...	2	...
Sergt.-Majors (W.O.)	1	1	1	1	...	1	...	1	...
Batt. Sergt.-Majors ...	1	1	1	1	...	1	...	1	...
Batt. Q.-M.-S.s... ...	1	1	1	1	...	1	...	1	...
Farrier.-Sergts.	1	1	1	1	...	1	...	1	...
Sergts....	6	6	4	6	...	6	...	4	...
Shoeing-Smiths	5	5	3	1	...	1	...	1	...
Collar-Makers	3	3	2	...	...	...	...	...	...
Wheelers	3	3	2	...	...	...	...	...	...
Trumpeters	2	2	2	2	...	2	...	2	...
Corporals	6	6	4	4	...	4	...	4	...
Bombardiers	6	6	4						
Gunners	48	42	28	...	...	...	...	...	...
Drivers	110	104	51	...	182	...	172	...	74
Spare...	...	...	...	3	14	3	12	3	8
Totals...	197	185	107	26	196	26	184	22	82
Grand Total Horses ...	...	...	...	222[1]		210[1]		104[1]	

It is believed that the recent change which added a subaltern to Ammunition Columns did not apply to the Cavalry Brigade Ammunition Column.

TABLE B.

Vehicles and Horses Ammunition Columns.

Nature of Vehicles.	Vehicles.			Draught Horses.		
	Inft. Div.	Corps Troops.	Cav. Brig.	Inft. Div.	Corps Troops.	Cav. Brig.
Spare gun carriages...	1	4	1	4	16	4
Carts S. A. A.	10	2	8	20	4	16
Wagons — Ammunition with limbers 12-pr.	6	10	6	36	60	36
Wagons — A. and S. — For gun ammn.	6	10	...	36	60	...
Wagons — A. and S. — For S. A. A. ...	11	2	...	66	12	...
Wagons — R.A. ... — For stores	1	1	1	6	6	6
Equipment, supplies and reserve rations	2	2	1	8	8	6
Forge with limber R.A.	1	1	1	6	6	6
Spare	...	...	...	14	12	8
Totals	38	32	18	196	184	82

[1] One private horse.

Subdivision of Ammunition Columns.

From the above it will be seen that all Ammunition Columns are commanded by a Major. They are subdivided into sections, the larger columns into three sections and the Cavalry Brigade Ammunition Column into two. No definite orders have as yet been issued as to how this subdividing is to be done, it would, however, appear to be advantageous to divide the columns in such a manner that one subaltern should have charge of infantry ammunition, another gun ammunition, and another the stores and supplies, etc. The objection to this method of subdividing the column is that a section cannot be detached conveniently as it stands, but it does not appear to be advisable to divide the column, beyond the despatch of a few particular wagons to some given point where required. Even this should not be done when it can possibly be avoided.

The Ammunition Park which is constituted as follows has a staff of its own, Lieut.-Colonel, Adjutant, Veterinary-Surgeon and Medical Officer.

TABLE C.

Ammunition Park.

	"Personnel"			Horses					
Sections	1, 2 and 3	4	5	1, 2 and 3		4		5	
Ranks				R	D	R	D	R	D
Officers	3	3	3	3	...	3	...	3	...
Sergeant-Major (W.O.) } Staff Sergeants }	3	3	3	3	...	3	...	3	...
Farrier-Sergeants	1	1	1	1	...	1	...	1	...
Sergeants...	5	4	4	5	...	4	...	4	...
Shoeing-Smiths	3	3	3	1	...	1	...	1	...
Collar-Makers	2	2	2	...	...	...	...	...	...
Wheelers	2	2	2	...	...	...	...	...	...
Trumpeters	2	2	2	2	...	2	...	2	...
Corporals	4	3	3 }	4	...	3	...	3	...
Bombardiers	4	3	3 }						
Gunners	36	32	26	...	...	...	...	...	...
Drivers	91	78	60	...	150	...	126	...	90
Spare...	...	...	...	2	14	3	10	3	10
Totals	156	136	112	21	164	20	136	20	100
Grand Total Horses ...	...	...	...	185		156		120	

TABLE D.

Vehicles and Horses Ammunition Park.

Sections	Number of Vehicles			Draught Horses		
	1, 2, 3	4	5	1, 2, 3	4	5
Nature of vehicle						
Wagons A. and S., R.A., 6 horse	22	18	12	132	108	72
,, ,, ,, ,, 4 horse	3	3	3	12	12	12
Forge with limber, R.A.	1	1	1	6	6	6
Spare	...	...	...	14	10	10
Totals	26	22	16	164	136	100

What is carried by Ammunition Columns.

The Ammunition Columns actually carry the ammunition mentioned above, and also a certain number of spare wheels and shafts and other materials for repair. Though these latter would to a certain extent be necessary for the preservation of the column in the field, it will certainly be called upon to supply these stores to the batteries in front of it, which will most assuredly suffer more severely than it does itself. The spare gun carriages, wheels and shafts are, however, articles which the Ammunition Columns can supply without loss of efficiency in itself. This is a point to be borne in mind though it is not of paramount importance.

Place in chain of command.

The next point we must touch upon is the question of how these Ammunition Columns and Parks fit into the chain of command of the fighting units. The Divisional Ammunition Column is directly under the orders of the Lieut.-Colonel commanding the artillery brigade-division in the division. He will usually receive instructions limiting the position of his Ammunition Column from the General commanding the division. It is, however, obvious that when the Lieut.-Colonel is fighting his batteries, orders will often have to be sent direct to the officer commanding the Ammunition Column from the divisional head-quarters. The Lieut.-Colonel should receive information as regards these orders from his subordinate whenever possible. In the Corps Troops Ammunition Column the Colonel commanding the corps artillery will give all orders as regards the disposition of this Ammunition Column, subject of course to limitations given in the orders he may receive from corps head-quarters. The officers commanding Cavalry Brigade Ammunition Column will receive all orders direct from the officer commanding the cavalry brigade. There can be no other intermediary, but corps head-quarter orders will often over-ride his decisions and will very often dictate to him exactly where the column must march, immediate attendance on the brigade being quite impossible. As regards Ammunition Parks, each being commanded by a Lieut.-Colonel, is an independent command and receives its orders

direct from the corps head-quarters through the officer commanding R.A. who is on the staff of the army corps.

Having stated the constitution and position in the army corps of the Ammunition Columns and Park, we can now, taking an army corps as our unit, study their duties, positions and probable movements in action. It may be taken as an axiom that an army will be fighting one of the following three classes of battles, and that this will have an influence on the general conduct of the Ammunition Columns and Parks. These are, as everybody knows:—(1.) The defensive action, which must be subdivided into two heads. (1*a*.) The army corps having taken up a defensive position to meet attack, in which it intends to fight to the last, and:—(1*b*.) The rear-guard action. (2.) The offensive action, in which an enemy in such a position as (1*a*.) is being systematically attacked. (3.) The unpremeditated action, where two opposing armies meet on the march and fight very much as they happen to come up.

The different positions in different engagements.

(1).

(2).

(3).

It is self-evident that the *rôle* of the Ammunition Columns must be very different in each of these cases, and that different orders will have to be given in each case. We will first consider the position in action which would probably be the best for the Ammunition Columns and Parks in each of these cases. (1*a*.) Here much can be arranged beforehand. Everything depends on bringing a continuous fire on the enemy from the moment that his columns come into sight until the time when he delivers his final attack. It will be reasonable to suppose that in a defensive position there will be cover available at no great distance from the fighting line where the Ammunition Columns can be parked. These positions can be clearly shown to the troops engaged. They should be near a road or, if possible, two or more roads leading to the front. Two openings should be made in the fence if the Ammunition Column is parked in an enclosed field; one for empty wagons and carts to come in by, and the other as an exit to the front for full ones; the rule of the road being observed in the selection of these openings to prevent any crossing of wagons and carts. Some light guide posts should be placed showing the way to the Ammunition Column, each of which should bear the number and designation of the Ammunition Column. It is obvious that the position selected should be as close to the troops engaged as is consistent with comparative safety from fire, and the fact that in case of retreat the Ammunition Column may be able to get out of the way and escape capture. A distance of a mile should in such a case be amply sufficient unless there is some natural defile behind the position which would cause the column to be very much exposed had it to retreat over or through it. In this contingency, if not too far distant, the further side of the defile would appear to be a good place, but the distance should not exceed two miles. The Park can, in this case, be advanced to from five or six miles from the Ammunition Columns to facilitate the filling of the latter, as there will be no immediate danger of its crowding roads which should be quite clear of troops, these being already all concentrated at the front. If, however, any rear-guard position has been selected in the event of defeat, the Park should be behind this.

Position Case (1*a*.).

Position Case (1b.). In case (1b.), the rear-guard action, the Ammunition Column will have no place near the fighting line, as no position of this kind can be safely held after the enemy has once fully deployed for attack, the object of taking up the position then having been gained. The Ammunition Columns should be at the head of the retreating main bodies; they should take advantage of any halt to fill up any empty regimental reserves which can reach them, but it is doubtful if much can be done beyond leaving wagons and carts in reply to a demand from the fighting units. The Ammunition Park would in this case be sent as far to the rear as possible in order that it may in no way impede the rate of march of the columns, or embarrass the General in command by his having to take precautions of its safety. Any supply required from it should be left behind, and the wagons carrying this could rejoin the Park at an increased pace when empty. As, however, in retreat the object is to get beyond striking distance of the enemy, all delay in the movement of the Ammunition Columns and Parks is to be avoided.

Position Case (2). In case (2), the fact of an attack on a position presupposes a certain definite superiority on the part of the attacker. This will allow the Ammunition Columns of the troops destined for the attack to be close to them. The columns will probably be parked in the first instance, but this should not prevent them from advancing on definite lines, to support their units with fresh ammunition at the important juncture. As in the initial stages of the attack the troops engaged will be a very long way from the enemy, everything has to move forward and the supply of ammunition in rear must move forward too, or the distance between the Ammunition Columns and the troops they have to feed will become very great, and that worst of all situations may arise, of troops having attained a position from which an effective fire can be delivered only to find themselves without the necessary means of offence. From this it would appear that in the attack a line of road would be a better situation for an Ammunition Column than any given spot. This, of course, will not prohibit the officer in charge from forming up in a field where he sees a chance when he cannot safely advance further and here making the necessary entrances and exits. The officer in charge of the Ammunition Column will have to ascertain for himself any change in the direction of the line of attack of his unit and conform to its movements as far as possible, always informing the officer in command of the unit of any deviation in direction that he has made from that already dictated to him. In this case it may be taken as a certainty that the Ammunition Columns will be at least two miles in rear of their units at the beginning of the day, and that if a march has to be made prior to the attack that the distance will at times be considerably increased; but this should not prevent them from closing up to a mile in rear of the troops when these become engaged.

The Park will be at the beginning of the day at the normal distance from the Ammunition Columns, it should close up during the fight to half that distance. The sections always informing their respective columns as to their ultimate destination if the whole Park does not

move together. The position of the Park will be more or less defined by the General Officer commanding the army corps, and his orders will probably prohibit an advance beyond some clearly defined line.

Position Case (3).

In case (3), that is to say, an army moving within striking distance of an enemy who is also on the move, much must be left to the development of events. In the first instance the normal position on the road will be occupied by the Ammunition Columns, and they should not close up or shorten this interval without definite orders, when the troops in front halt and deploy, and it is clear that an engagement of a serious nature is going to take place. It would, indeed, be probably advantageous to have the normal distance somewhat increased, to say three miles, as armies on the move may not meet with any great exactitude and Ammunition Columns close up to the fighting troops might be found to be very much in the way and impede the manœuvring power of the troops. They might have to retreat and would then block roads on which other troops were advancing. There will be no disadvantage in the Ammunition Columns being further to the rear, as the preliminary stages of the action will always give ample time to make good any lost ground. It is possible that, for tactical reasons, divisions may have to be moved across from one flank of a line of battle to another in this case, and the advantage of having Ammunition Columns well to the rear is then very obvious, as tending to diminish the confusion which such an undesirable movement is certain to make, when it has to be done. In this case the Parks will move a full day's march in rear of the army.

The above considerations are not exactly the supply in the field, but without first fully investigating where the Ammunition Columns will probably be we cannot define a line of action for them and decide what they can and should do. We now see that they can be of most immediate use in case (1*a*.), and least in case (1*b*.); while they have certain advantages as regards initial positions in case (2) over case (3).

The O.C. Ammunition Column's chief duties.

The point that an officer in charge of an Ammunition Column must have clearly before his eyes is that without efficient troops in front of him, he is useless, and that therefore he must never take into account the efficiency of the Ammunition Column in such points as men and horses, except as regards the small-arm ammunition section, as compared with the efficiency of the service and teams of the guns. It is, of course, obvious that the infantry must not lose their means of offence because the guns have suffered; but with regard to the rest, it is better that every wagon of the Ammunition Column should be left in any field, than that a single gun in the fighting line should be incapable of movement, or defective in fire effect. He in turn (the officer commanding Ammunition Column) will receive horses and men from the Park which will be supplied from the depôts and horse depôts; there may, of course, be some delay about the arrival of these reinforcements, but there must never be any delay in the supply to the front from the Ammunition Columns in case of need. It is, perhaps, superfluous to emphasize this point, but any officer in charge of a unit is apt to think first of the efficiency of his own command, which he sees, and thus neglect the only cause of his existence, which in this

case is to make the fighting portion of the army efficient. It is often so hard for us to bear in mind the general good, when a clear and visible personal disadvantage stares us in the face.

Particular duties of Divisional Ammunition Columns in case (1*a*).

We will now consider what a Divisional Ammunition Column can and should do during an action and after an action, after which we will treat the Corps Troops Ammunition Column and Cavalry Brigade Ammunition Column. We select this order so that we may take the more comprehensive first. We will first take the simplest case (1*a*), that of a Divisional Ammunition Column parked in a convenient situation behind its division, which forms part of the line in a defensive position. We will suppose that the enemy is making a methodical frontal attack—modifications will have to be made for those of flank divisions, or divisions held in reserve; with these latter the columns will have to act very much as in case (3). In case (1*a*), we may presume that the first demand will be for artillery ammunition, empty wagons will come in from the front as the artillery duel progresses, some of these may be short of horses, but this is not very likely as in such a position as we are at present considering the teams can usually be well protected by the ground. The wagons and wagon limbers which come up should be inspected as soon as they arrive in the field where the Ammunition Column is parked. The officer in charge must make up his mind at once as regards what changes in horses are necessary. Time here is always an important factor; that lost on the road is the result of circumstances over which he has no control, but any hesitation as to what is to be done in his command will cause avoidable delay. The orders of the officer in charge must be concise, he must state to what section each individual vehicle is to go, and tell the subaltern officer in charge of the section whether the wagons are to be refilled and returned or simply exchanged. If refilled, the limber and wagon should be drawn up close to an A. and S. wagon in which the packing cases have already been opened and two men set to refill each box; if exchanged, the teams should be immediately unhooked and hooked again into one of the full ammunition wagons of the column, the kits of the gunners being transferred from one wagon to the other. As soon as each consignment of wagons is ready, it should be immediately despatched to rejoin its unit at the front. The empty wagons which are left behind should then be filled from A. and S. wagons of the column, and made ready in every respect to go to the front again. As soon as three A. and S. wagons are empty, they should be despatched under the charge of an N.-C. officer to the Ammunition Park; any loss in horses can be made good by sending these to the rear under horsed, or with horses that have suffered from the effects of the campaign, as it may be possible to replace them at the Park. Wounded horses which can travel should be sent with this detachment. No seriously injured horse should ever come to the Ammunition Column, as these are not worth their food, and should be shot when they are disabled. Horses which are sent to the rear may become fit for work again at the horse depôts; they are only a useless encumbrance at the front. The front is the hardest place to feed anything, and no temporarily useless animal should be kept there.

S.A.A. carts will also arrive at the Ammunition Column empty from the front. These should be sent direct to the officer in charge of the infantry ammunition section, who will cause the horses to be unhooked and, if fit, immediately hooked into full S.A.A. carts, the empty ones being placed beside an A. and S. wagon and refilled by the men of the Ammunition Column. Should carts or wagons come back a second time to the Ammunition Column they should always be exchanged as far as possible with carts or wagons belonging to the unit from which they came originally to avoid confusion.

As the day wears on and the critical phases of the action are reached, the officer commanding the Ammunition Column will probably find that one of two alternatives lie before him; either his army has been successful in resisting the attack and will require all the aid that he can give it to render it efficient for a forward movement at once or on the morrow; or that there are evident signs of defeat, confusion and retreat. If success appear to be probable, he will quietly continue his action of supply as in the earlier part of the day, until it is evident that the last effort of the enemy has been made and has failed, or that a successful counter attack has been made by his own people. Then it will be his duty, failing the receipt of orders, to ride forward to the brigade division he supplies and find out from the officer in charge what he can do to replace deficiencies in men, horses and *matériel* (gun carriages, wheels, etc.); at the same time sending the subaltern in charge of the infantry ammunition section to the officers commanding the brigades to collect reports as to the amount of ammunition required. When this has been done, the officer commanding Divisional Ammunition Column should send forward all that is required which he can supply, and remove all damaged articles that his artificers can make serviceable again. All useless articles being thrown away as no useless extra weight should be carried, especially as it must be borne in mind that the haulage power of the horses in the command generally will have been to a certain extent reduced. This can be made good, to a certain extent, by repeating the former action of sending empty wagons to the rear with two or four horses. At the end of a successful engagement the supply should be done entirely from the rear to enable the fighting units to recruit to the utmost the energy necessarily expended in action. In retreat, however, the case is different; the fighting energy has gone out of the men and the best hope of recovering it lies in getting beyond striking distance of the enemy as quickly as possible, so everything must be done to conduct a rapid and, if feasible, an orderly retreat. To attain this, it is clear that a most arduous duty lies before the officer commanding the Ammunition Column when he sees that the retreat of the troops covering his front is inevitable. Clear roads are essential and it is therefore his duty to retire, but an ill advised retreat is the worst error he can commit. To prevent this, he will, when he first feels that things are going badly, send all his less mobile wagons on to the road and retire them a mile or so at a walk, with distinct orders where to halt and await the development of events, while he himself should wait with the ammunition wagons, the S.A.A. carts and spare horses in his original

position until he sees that retreat is inevitable, or receives orders from the General commanding the division that such is the intention. He should then send all spare horses to the artillery in charge of a subaltern and rejoin the portion of his column he has sent to the rear at a trot, after which he will put as much space between himself and the enemy as is compatible with keeping touch with his own division. The whole of his action under these circumstances will require a very cool head and clear judgment; to retire when he can still be of any possible use to the troops in his front would have a deleterious effect upon them besides being unsoldierlike, while he may also do infinite harm if he remains too long and causes thereby more confusion than that which is always inseparable from defeat and retreat.

Case (1*a*). A flank Div. Ammunition Column

In the case of a division on the flank of an army the position of the Ammunition Column will naturally be as far from the exposed flank as possible, and the lines of supply and retreat should be arranged accordingly. They should be covered as far as possible by natural screens. The officer commanding this Ammunition Column should be kept informed of outflanking movements of the enemy. His duties will be the same as those of other Divisional Ammunition Columns, but the outflanking movement of the enemy, should he not be covered by a natural obstacle, will cause him to make preparations for retirement earlier than otherwise would be the case.

Case (1*a*). A Division held in reserve.

The action of an Ammunition Column of a division held in reserve will vary with the circumstances. Should the whole division be held in reserve the action will be similar to case (3), which will be treated later. Should the artillery be in action while only the infantry is held in hand it will be necessary to make a division of the column, the artillery ammunition section or a portion of it being sent to the Divisional or Corps Troops Ammunition Column which is nearest this artillery. When the infantry is brought into action a certain number of S.A.A. carts should be sent to the Ammunition Column nearest to this infantry. It will always be easier to find an Ammunition Column than a detached portion. As far as possible, the supply of the division should be carried out by its own column, not to place an undue strain on the other columns which will have been already more severely taxed. The head-quarters of this Ammunition Column must be well in rear. All empty wagons must return to this to be despatched to the Park, and the officer commanding must let no details out of his control or there is bound to be confusion.

Case (1*a*). Corps Troops Ammunition Column.

The position of Corps Troops Ammunition Column is behind the corps artillery. The action is similar to that of the Division Ammunition Column, only that the infantry portion will require little attention. Should the corps infantry battalion be detached it should be supplied from the nearest Ammunition Column and no detachment made from this Ammunition Column.

Case (1*a*). Cav. Brig. Ammunition Column.

The Cavalry Brigade Ammunition Column must be kept well to the rear; cavalry will almost invariably bivouac behind the infantry. To supply this very mobile arm while in action is hopeless. Supply must be carried out after it has been in action, and if possible from the rear.

The nature of the country, position of the enemy and the special orders given to the brigade may dictate to a certain extent to which flank this Ammunition Column should be inclined; but it would appear that behind the centre would be the best place, or, perhaps, on the main road. The supply after the action should be similar to that of Divisional Ammunition Column.

Case 2. Divisional Ammunition Column.

When we consider how much has to be thought of in the most simple case of an army in a defensive position, we feel how very difficult must be the task of the officer commanding an Ammunition Column where very little is arranged beforehand as in the case of the attack. Again we will consider the simplest and most comprehensive first, namely, the Division Ammunition Column. It may be supposed that reconnaissance has discovered the limits of the position, and that the attacking army has extended or contracted its front to a somewhat similar extent; that is to say, that circumstances exist more or less similar to those of the French army on the second day of the battle of the Lisaine. We will not assume, however, a "moral" similar to that of the French, or that the extreme weather exists, or that the country is so deficient in roads, as under these conditions Ammunition Columns will be able to do little or nothing on either side during an action, being of necessity too far to the rear.

As we have previously stated, the Ammunition Columns will be further to the rear in this case at the commencement of the action than in that of the defence. The roads will be blocked to a certain extent by troops, and cannot be perfectly known. The general line of advance of each division will be known, and the artillery will make known the position it has taken up by the sound of its fire—until this happens there can be no need of Ammunition Columns.

The officer commanding an Ammunition Column will thus gather where he has to go in the case of a division forming part of the frontal attack. He must close up as the action begins to about a mile in rear of the guns, selecting a position, sufficiently sheltered, where he can be easily found. He must inform the officer commanding the brigade division, R.A. of the position he has selected, and having parked his column, should proceed to supply artillery ammunition, as in the case of the defence. He can do little to supply the advancing infantry, as they will be a long way in advance. Empty carts may come back and should be immediately exchanged for full ones and despatched. But little can be done to supply attacking infantry until it takes up an effective fire position, such as advocated by V. Hoenig for the attack on the line Moscou-Point de Jour from Gravelotte. In such a position, carts could proceed to the wood or other cover in rear, and mules and ammunition bearers could do something to feed the fighting line from thence at great cost and danger—but even this could scarcely influence the Ammunition Column. What can be done, must be done, but all that the Ammunition Column can do is to replace empty carts and refill those sent back. The officer commanding must not press any portion of his command forward into the zone of artillery aimed fire and the carts of the infantry will only seldom reach him. He can, however, keep the artillery ammunition wagons full, so that when the artillery

advances it may have full boxes everywhere to start with. As the critical phases of the battle approach, he must wait ready to follow a general advance, but it will scarcely ever be advisable for him to advance until the position is crowned. He may have to send teams to get guns out of action in exposed positions, but it will usually be better to leave guns where they are, unless there is not sufficient power of resistance left in the attack to meet a counter attack, and all this he can scarcely know, and can only act in obedience to direct orders received.

Should, however, defeat and retreat appear certain, the officer commanding the Ammunition Column must take steps to retire; action similar to that above described for retirement will apply here also. In the event of a distinct success, the Ammunition Column must be brought up at once to the fighting troops, and everything possible done for them. They must rest and should not be asked to work.

Case 2. Divisional Ammn. Col. of flank attack.

A division making a flank attack cannot be supported during the attack; this is of the nature of a sudden effort and the ammunition carried regimentally should always suffice.

Case 2. Corps Troops Ammunition Column.

The Corps Troops Ammunition Column will act in a similar manner to the divisional; it can, however, only attempt to supply artillery during the action. It can send assistance to whatever column is by force of circumstances obliged to supply the corps battalion should it be engaged. This is, however, a very small portion of its duty.

Case 2. Cavalry Brigade Ammunition Column.

The Cavalry Brigade Ammunition Column will remain in rear of whichever flank of the corps the cavalry brigade may be acting. Regimental carts and some of the artillery ammunition wagons will probably stay with it. These can go to the front to supply the brigade when it is inactive, which will be always during a considerable portion of the engagement. As cavalry in action is nearly always behind the infantry the supply of this arm is simple. It will of necessity have to find its Ammunition Column and make its demands, as the column cannot move about to suit the continually varying position of the cavalry brigade.

Case 3.

Here the Ammunition Columns, of whatever nature, can only take part during the action when the preliminaries are over, and, as a matter of fact, one of the two previously described cases has been assumed by the army in question.

The columns will of necessity have to come up some distance from the rear, but must park further off than in either of the above mentioned cases, so as little can be definitely known of what is going to take place, that their presence close up would be a grave danger. Troops may have to be moved from one flank to another—nothing can be considered as settled. A general uniformity of movement at a respectful distance is all that can be dictated, most careful reports of these movements being always sent forward, unless specific orders are received. When in this case an Ammunition Column is finally parked, the work of replenishing loss will be more arduous than in the previous cases, as it is certain to be more or less late in the day, while, from the nature of things, the losses in horses and drivers will probably be greater than in the other cases, as cover cannot be so well utilised

on imperfectly reconnoitred ground. The system of supply will be similar, but the actual work more straining. The extent to which the Ammunition Columns may have to sacrifice their mobility and their existence must know no bounds.

In this case it may also be sometimes advisable to leave some of the A. and S. wagons with both artillery and infantry ammunition some four or five miles in rear, only taking forward a limited quantity, but all ammunition wagons, S.A.A. carts, means of repair, spare gun carriages and spare horses must go to the front. The rear portion can be called up as the situation develops, and, in case of a rapid defeat, the loss will be minimised. In the event of success, the officer commanding Ammunition Column will act as described in case (1), the night after the battle being for him the most busy time. Every nerve must be strained to complete the infantry and cavalry in ammunition and horses for their regimental transport, and the artillery in ammunition, horses, stores, equipment and men. The distances which will have to be traversed and the difficulty in finding mixed up units being both greater than in the previous cases, the completion of this task will take many hours from the night. When all is finished, the Ammunition Columns must themselves be inspected, a convoy of empties sent to the rear and demands on the Park made out, with a return of the ammunition expended.

Parks.

The Parks generally, moving as they do from seven to fifteen miles in rear of the army, are not able to independently do much for the Ammunition Columns. They have to supply demands as they arrive, and in turn fill up their own deficiencies. It may often be found possible to use local country transport when the Park becomes deficient in mobility owing to demands made upon it. The same principle must be borne in mind as with the Ammunition Columns; that so long as the Ammunition Columns are complete it does not signify to what extent the Park has to suffer; a perfect Park is useless unless the columns in front are supplied. The efficiency of the Park must come from the rear, and not be secured by the sacrifice of the troops in front.

Issues and receipts.

All issues of ammunition, stores, etc. should always be noted in writing and, if possible, receipts received, a simple form being used during and after action. A pocket-book of waterproof paper ruled thus would be convenient:—

	Receipt.	Delivery Note.
Issued at..... Time... ... ... 3.15 p.m. Date... ... ... 27. 2. 96. To order of Lieut.-Col. Smith— 2 Amm. wagons complete. N.B.—Received two empty wagons with small stores.	Received from O.C. 5th Div. Amm. Col.— 2 Amm. wagons complete. T. Atkins, Q.-M.-Sergt., R.A., 27. 2. 96. 47th F.B.	Issued by O.C. 5th Div. Amm. Col.— 2 Amm. wagons complete. A. Grey, Lieut. R.A., 5th Div. Amm. Col. N.B.—Received 2 empty wagons with small stores. A.G.

All question of complicated and bulky receipt and delivery vouchers are entirely out of place, but so long as no time is lost, much incon-

venience in adjusting accounts will be saved by a simple book. Unless accounts are of the most simple in war, they will not be kept at all, as anybody can lose a book. That they would be useful is certain, and a rough and ready system would answer all requirements.

Conclusion. The key to handling an Ammunition Column well in the field is like everything else in war—the possession of a cool head and the faculty of telling by the signs of the times what is the exact state of the fight in front. The officers commanding must always be prepared to sacrifice their commands to any extent to assist the troops in front; but to do this well and at the same time to do their duty to their commands, they must always have both eyes wide open, and be prepared to act calmly and at once under all circumstances.

AMMUNITION COLUMNS AND PARKS, CONSIDERED WITH REFERENCE TO THE REPLACEMENT OF AMMUNITION, HORSES AND MEN DURING AND AFTER AN ACTION.

BY

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"HOLD SURE."

SILVER MEDAL PRIZE ESSAY, 1896.

TREATMENT OF SUBJECT.

PART I.—Meaning—Tactics—Functions of Columns and Parks—Amount of Ammunition to be carried—Foreign Systems.

PART II.—Interior Organizations of Units—Carriages—Supply of Material—*Personnel*—Horses—Subdivisions of Units.

PART III.—Summary of Conclusions—Comparisons with existing Organizations—General Remarks—Columns and Parks during an Action.

PART I.

THE organization in peace time of Ammunition Columns and Parks as an integral part of an army is a comparatively new feature in army systems and it is only during quite the last few years that they have taken practical shape in our service.

As it is the purpose of the subject of this essay to elicit discussion and ideas as to how these Ammunition Columns and Parks may be best organized to meet their object, it would be well to understand exactly what each of these terms means and what are the functions and tactics of a "Column" and of a "Park."

Columns. By an Ammunition Column we understand that part of the subdivisions of an army which carries the ammunition of the fighting line, which cannot be carried by that line itself, it is a tactical part of the army and must move with, and keep close to, the fighting line.

Park. The Ammunition Park is the feeder of the fighting line and connects it through the Ammunition Columns with the ordnance stores at the base.

The "Column" supplies the troops *during* an action, the "Park"

after an action. That is to say that the "Column" empties itself into the fighting line and is filled up by the "Park," ready to follow the army, while the "Park" is filled up, as can best be done, from the base.

It has been the custom in most European armies for the artillery to have charge of all ammunition supplies, a charge for which the decentralised training of the artillery is eminently suited.

To no unit of an army is the expansible cadre system more applicable than to a Column or a Park, for its *personnel* needs little training and can very easily be organized from reservists.

Organization.

Points to be considered.

In discussing the organization of Columns and Parks to perform the functions detailed above, the following points would naturally suggest themselves :—

(1). What should be the tactical distribution of the Columns and Parks?
(2). What amount of ammunition is to be carried by them?
(3). How should they be arranged internally?

Tactical Considerations.

With regard to (1) it is evident that each army corps at least must have its ammunition supplies separate, but one big train to supply the whole of an army corps would be an unwieldy unit. Under our organization an army corps has four components, three divisions and the corps troops and it will greatly facilitate the supply of ammunition if the first reserves, viz., the Columns, are under the command of the divisional Generals, while the corps troops have a Column to themselves.

By allotting an Ammunition Column to each component of a corps, any component detached from the corps would be able to move intact.

This desire to be able to move divisions intact would also entail a similar organization for the Park. In Continental armies, where a corps would rarely be split up, such a system is not necessary for a Park, which can then be organized as simplicity dictates. In our service where, apart from home defence, any corps, or portion of a corps, may be required for an expeditionary force, a system which will render possible the detachment of any division, complete, down to the base, at short notice, is obviously the best.

Continental Systems.

German Ammunition Park.

Germany has organized her ammunition train as follows :—

Ten Columns per army corps, divided into two echelons of five Columns each. The first echelon corresponding to our Columns, the second echelon to our Park. A German army corps has two divisions instead of three, and each division has a Column for infantry and a Column for artillery ammunition and one for the corps artillery.

French Ammunition Park.

France also divides her train into two echelons, the first having six sections, one section for the infantry and one for the artillery of each division, while two sections are reserved for the corps artillery.

In the second echelon she has only four sections, three of which carry mixed ammunition and one artillery ammunition only.

England.

Our organization is one column per division (in our army there being three divisions) and one for the corps artillery—four in all. While we have a Column for every cavalry brigade, of which two can combine to form a divisional Column. Our own system.

As every corps would have a cavalry brigade or division in connection with it, our corps Park has five sections, four of which are assimilated to the four Columns of the corps, the fifth to the Column of the cavalry brigade or division.

Each divisional Ammunition Column is similar, while the corps troops and cavalry Columns have special organizations.

Similarly, the three divisional sections of the Park are similar, the corps troops and cavalry sections being different.

It should be noted, however, that though the Ammunition Columns are directly under the command of the divisional cavalry and corps artillery commanders, the five sections of the Park are under normal conditions massed under one commandant under the orders of the corps commander.

Any complication, entailed by having three different organizations of the Park sections, is compensated for by the facility with which any portion of the army corps can be detached complete with its Column and Park.

This glance at our own system and those of two of the great military nations shows that we practically resemble them, with special adaptations for our own wants, and it may fairly be assumed that the manner in which Columns are allotted to units of the army corps is that most suited for war.

Number of Rounds to be Carried.

The object of the Columns being to supply troops during and after an action and the Park to fill up the Columns ready to move on with the army, the number of rounds should not exceed those necessary for this purpose, it being remembered that the trains actually accompanying an army are quite big enough and only carry stores to make the army, when at full pressure, independent of the depôts on its communications for a few days.

Major Stone, R.A., in the "Proceedings" of the R.A.I. for 1895, pages 537 to 544, in an article which seems to have anticipated every want of the writer of an essay like the present, gives a series of statistics of losses and expenditure of German artillery in the consecutive battles of Colombey, Mars-la-Tour and Gravelotte. No greater strain can be imagined on the ammunition supply trains than the replacement of casualties and ammunition for these three battles, without resource to the depôts in rear. Expenditure at Colombey, Mars-la-Tour and Gravelotte.

He shows us that the average expenditure per battery per battle was 313 rounds, or 939 for three battles, or if all the batteries had six guns, 156·5 rounds per gun.

This we may certainly take as a fair guide to our needs and should arrange to carry between Column and Park, as their mobility organization best dictates, a number of rounds similar to this.

In our service we have arranged to carry—

Rounds per gun, in the Columns...	74	146
Ditto ditto, Park	72	

While the infantry rounds have been fixed at for the Lee-Metford—

Rounds per rifle, in Columns	77	137
Ditto ditto, in Park	60	

It will be noticed that our rounds per gun are not quite up to the average, but are not far from it.

This applies only to arrangements for the 12-pr. The introduction of a heavier field-gun and consequent alteration will be alluded to later.

PART II.

Internal Arrangement of Ammunition Units.

Having decided how many Columns should accompany an army corps and how many sections the Park consists of, it remains to discuss the internal arrangements. These should be made with regard to—

(1). Suitability for command.
(2). Being officered and manned from the artillery, similarity in organization to artillery.
(3). Simplicity.
(4). Carrying capacity and mobility.
(5). Similarity of the wagons to artillery, so far as replacement of material may demand.
(6). Similarity of all harness in Park and Column to artillery harness, so that horses may be transferred intact as they stand in the teams.
(7). Suitability for supply.

With regard to suitability and facility for command the connection of each column with the brigade division of artillery, as well as its internal administration, is much simplified if it can be organized like a battery. The same may be said of the sections of a Park.

Number of carriages.

The number of carriages to carry the ammunition required is not too large in each Column for formation into six sub-divisions in the divisional and corps troops columns and four in the cavalry brigade column. In the Parks the number of carriages in each section is less than in the Columns and can be organized into fewer sub-divisions.

Simplicity.

Simplicity is to be gained by having as few varieties of carriages and draft as possible and in making the organization of each Column or section as like one another as possible. It will be seen that there are more varieties in the Columns than in the Park.

The carriages available in our Service are :—

(1). Artillery ammunition wagons as used in the batteries.
(2). Small-arm ammunition carts.
(3). Ammunition and store wagons of considerable capacity for either small-arm or gun ammunition.

So far as the strength and mobility for going across country is concerned, nothing could be better than artillery-ammunition wagons and small-arm-ammunition carts, but the carrying capacity of both of these is far less than the ammunition-and-store wagon.

As regards mobility, then, Royal Artillery wagons and small-arm-ammunition carts are desirable. As regards capacity, and hence, the length of column on line of march, the ammunition-and-store wagon is far preferable.

The composition of the Columns, then, must be a compromise on the basis that only such number of the more mobile carriages should be allotted as will suffice to keep up a flow of ammunition from the Column, which will not be far off the road, to the fighting line.

As the battalion carts of the infantry and the wagons of the batteries are also available for this purpose, the mobile carriages in the Column need not be very many.

Cavalry Ammunition Columns.

When artillery and infantry are deployed for action it is evident, that save in very exceptional circumstances, they will not be very far from the roads along which they have advanced, and along which the Ammunition Columns will move and form up close to, the small proportion only of the mobile carriages having to move across country.

The case of a cavalry brigade or division, however, is different. They will frequently move and manœuvre for days in directions away from, and often at right angles to, the roads by which the army is advancing, and their Ammunition Columns must be able to follow them without difficulty and perhaps move up for some distance at a fairly rapid pace. It would, therefore, seem necessary that all the carriages of a cavalry column should be of the mobile order, save those actually carrying the tents and stores. This will be the artillery-ammunition wagons for the Royal Horse Artillery battery ammunition, the small-arm-ammunition carts for the cavalry.

Wagons for the Park.

Looking to the nature of carriages for the Park sections, as the Park is never intended to move off the roads, the capacious ammunition and store wagons are evidently the most suitable for all sorts of ammunition or stores. The section, too, which supplies the Cavalry Ammunition Columns would never require, as those columns do, to move off the road and should consist of the ammunition and store wagon.

Thus the organization of the Park sections will be of the simplest, only differing in the number of carriages required for each.

Replacement of Artillery Material.

With regard to the replacement of wheels, shafts and similar stores, it is desirable to find out what loss might be expected, let us say, in a series of actions or in a march of considerable difficulty. We must bear in mind that batteries have with them enough spare stores, wheels, etc. for immediate use, that the Columns should only make good these spare stores as the batteries use them and that it only would be required to do so after one or, at most, two general engagements before being supplied again from its Park.

Similarly, the Park would not be required to fill up a Column with

stores for long without being re-supplied from the base or intermediate depôts.

Chain of connection between army and depôts.

The idea of the chain of Column and Park connecting fighting line with the base is that the links in rear should fill up the link in its immediate front, the rear link recouping itself from the base.

The losses of the German artillery at Colombey, Mars-la-Tour and Gravelotte would seem to offer a very fair criterion to judge of the losses in material and *personnel* which must be made good by Columns and Parks. It would be difficult to imagine a case where these units would be required to do more without being filled up from the base.

Major Stone gives the following statistics *re* losses in material.

	1	2	3
Material.	Maxima in any one battle.	Averages for the three battles.	Totals for the three battles.
Gun Carriages	1 per 26 Batteries at Colombey.	1 per 44·5 Batteries.	1 per 15 Batteries.
Wheels	1 per 3 Batteries at Mars-la-Tour.	1 per 15 Batteries.	1 per 5 Batteries.
Poles	1 per 6 Batteries at Mars-la-Tour.	1 per 21 Batteries.	1 per 7 Batteries.

This table at once shows that an allowance of one spare gun-carriage per Ammunition Column will be very ample even in case of the five batteries depending on the Corps Troops Column.

As every battery carries spare wheels, and we see that 1 per 3 batteries was the *maximum*, it will be ample if every Royal Artillery ammunition wagon in the Column carries a spare wheel and every other one in the Cavalry Column (*vide* tables of Columns and Parks).

In the event of the loss of a wagon by explosion the Column would have to supply it, taking an ammunition-and-store wagon from the Park till another one could come up from the base. The loss in poles was so trifling that the spare shafts or poles if carried by Columns in the same proportion as by batteries would be ample. Major Stone's words, on page 538 of the R.A.I. "Proceedings," may well be taken as they stand on the subject of losses to material. He answers the argument, that as the losses to material from shell-fire are always insignificant, the losses to wheels and shafts would be much higher in an arduous march over bad country. That in battles like Mars-la-Tour, or Gravelotte, by saying—

1. "In battles like these, the rough cross-country work on the field of battle is an infinitely greater strain than the most trying march along the worst roads.
2. Experience has shewn that our material is so excellent that the roughest marches can be successfully performed with little or no damage to wheels. As an instance, we may recall the march of 1 Battery Royal Horse Artillery, 3 Batteries Field and 2 Batteries Heavy Field Artillery from the Indus to Kandahar without the loss of a wheel. This is probably the most severe march that a mixed artillery force has ever been called upon to undertake."

No more effective remarks could be made with regard to losses of material and it may at once be assumed that if Columns and sections of the Park carry the same proportions of spare stores as a battery all possible requirements can be met at once.

Harness.

Losses to harness are, all artillery officers will agree, very few and small and only require the collar-makers' assistance to repair. Where, of course, the real loss will come in, is when horses are left behind on the field and it has been impossible to remove the harness from them. In this case the Ammunition Column will supply the harnessed horse complete, being re-supplied from the Park which, when re-supplied with remounts, may have to drive them in skeleton harness till the stores arrive from the base.

Repair material.

The same axiom applies to this as to the Park and Columns generally, viz., each unit carries the same proportions as a battery, which being calculated to last some time, it is always possible to supply a portion to the unit in front. A battery would never have to use up all its supply at once, but whenever possible would fill up expenditure from the Column and so on down the chain of supply.

Supply of "Personnel."

'Personnel.'

In no army are spare soldiers in excess of the war establishment borne on the strength of a corps and taken into the field for the sake of supplying possible casualties. Armies trust to their depôts and organization of the lines of communication to supply drafts of men and horses to fill up casualties from battle or sickness. In cavalry or infantry corps the loss of a portion of their number does not affect the efficiency of the remainder. In the artillery, where guns cannot be served or driven with less than a certain number of men, it is necessary to have a proportion of spare gunners and drivers with the fighting unit. In the same way a Column or section of a Park must have sufficient spare to allow for casualties from sickness. It would, however, be obviously bad policy to carry more than the proportion of spare needed for this purpose to provide against possible consequences of an action which may not occur till an army has been some time in the field. The commissariat of an army would never stand the maintenance of ineffectives in the field.

The numbers of gunners and drivers in a battery should be calculated to allow of work being carried on after suffering normal loss both from sickness and one or two engagements. Columns and Parks should only have sufficient spare to allow of casualties from sickness.

Major Stone's figures here again are invaluable. He tells us in his first table that the average number of casualties per battery at Colombey, Mars-la-Tour and Gravelotte was eleven per battle, while the average for the four batteries which alone out of 134 took part in all three battles was 10 men per battery per battle, or 30 for the three battles.

He does not say how many were gunners and how many drivers, but in our service, at any rate, one could always be substituted for another

at a pinch. Now including sergeants, corporals and bombardiers a British battery at war strength abroad

Has { 93 gunners in the R.H.A.
„ { 95 „ „ F.A.

and including grooms

15 spare drivers in R.H.A.
8 „ in F.A.

Therefore a loss of 30 men would certainly not make a battery unserviceable, provided it was not already much below strength from sickness.

It would be the duty of Column and Park to fill up, so far as they could, sick casualties day by day, filling themselves up from the base, but they should not have a spare establishment larger than for their own needs. In cases of great need the Park would have to become temporarily unserviceable, entrusting the supply department of the army with its stores, or being recruited from hired transport.

It is evident that any battery suffering abnormal loss in men and horses, or material, cannot be expected to resume the field for some time. Arrangements for supply can only be calculated on average wants.

Where a battery or brigade division had suffered so heavily that its own Columns and Park sections could not possibly bring it up to an effective strength, it must either await drafts or be recruited from more fortunate batteries.

Horses.

Horses. Almost the same remarks would apply to horses, as an army cannot feed any large number of spare horses, but must look to a well-organized line of remount depôts, to prevent its falling below the minimum of efficiency.

Horses would be forthcoming if needed from the 6-horse wagons which, especially in the Park, could be worked for a time with 4, while empty wagons instead of returning to the Parks would be left behind and their horses sent to the front.

A similar proportion of spare horses should then accompany each Column and Park Section as in a battery with a view to replacing the ordinary casualties of the march.

To refer to Major Stone again we see that the mean loss in horses per battery per battle for the three battles is 15, and for the four batteries taking part in all three, 17 per battery per battle, total of 51. With such heavy casualties as this it would remain with the officer commanding Royal Artillery and the officer commanding the army corps to say if the battery should stay behind to refit or if the Park Section should be the unit to suffer in the end.

Interior Arrangement of Unit with Reference to Supply of Ammunition to Fighting Line.

Reasons have been discussed for organizing each unit as a battery with six or less sub-divisions if the number of wagons will allow of it. It should now be stated that, as it may often occur, when the artillery or infantry ammunition is wanted in separate parts of the field and

that the artillery wagons may have to move to the front early in the day, artillery and infantry ammunition should be separate.

This can be managed by grouping each by sections of three sub-divisions, a subaltern commanding each section. This simplifies facilities, supervision of packing, etc.

Similarly, as a portion of the carts and wagons may often have to move across country to issue ammunition prior to a fight, etc., the more mobile wagons and carts should be grouped by sub-divisions. It is of no importance if the number of men and carriages in each sub-division varies, the tactical sub-division would seem to be the important point.

In the Park, however, all sub-divisions can be alike.

Considering that the Column or Park section has always a main body from which sub-divisions may be despatched with ammunition, all the wagons for the use of the unit, such as the forge, tents, supply wagons, etc. should be grouped and form one sub-division by itself. A glance at the number of wagons will show the feasibility of this.

Supply wagons of unit to form one sub-division.

PART III.

It now remains to sum up the conclusions and discussions on the various points and to glance at our present organization and see if it embraces them all. They would seem to be—

Conditions.

1.—That the ammunition will be best supplied if the Columns are small and under the control of the commander of each tactical division of the army corps.

2.—That the sections of Park should be one command under the orders of the commander of the army corps.

3.—The amount of ammunition to be carried should only suffice for the immediate wants during and after an engagement or series of engagements prolonged for two or three days, during which the army must depend on what supplies it carries with it.

4.—The organization of the Park should correspond and be affiliated to that of the Columns, allowing despatch complete of a portion of the corps.

5.—Each unit, Column or Park, should resemble, so far as may be, a battery.

6.—The carriages of the Column should be the most capacious that can move along roads, excepting a small proportion which should be capable of moving across country.

7.—The Cavalry Brigade or Division Columns should have all its ammunition carriages of the cross country order.

8.—The Park being purely roadster should consist of the more capacious wagons entirely.

9.—It is contrary to the spirit of the chain of supply to allow for spare men or horses in Columns or Park to replace casualties in action. Only such proportion to be spare as will allow of the every day working casualties.

10.—The loss to material being shown to be so small, no provisions need be made beyond the ordinary proportion of spare stores and repair material.

11.—The gun and small-arms ammunition wagons to be kept in separate groups in the supply units, each under a subaltern officer.

12.—The "cross-country" wagons and carts forming the smaller proportion of the Columns to be in separate sub-divisions, allowing of the despatch complete to the front under the sergeants of sub-divisions.

13.—The "unit" wagons, viz., forge, etc. to form a separate sub-division.

It now remains to compare our own Column and Park organizations.

TABLE SHOWING CONSTITUTION IN MEN, HORSES AND CARRIAGES OF OUR AMMUNITION COLUMNS AND PARK FOR THE 12-PR. GUN.

TABLE I.

	Ammunition Columns.			Park.				
	Divisional Columns	Corps Troops Column.	Cavalry Brigade Column.	Park Staff	1st, 2nd, 3rd, Sect. (Divisional).	4th Section.	5th Section.	
Officers	3	3	3	5	3	3	3	
Staff-Sergeants	3	3	3	1	3	3	3	
Sergeants	6	6	4	...	5	4	4	
Corporals	6	6	4	...	4	3	3	
Bombardiers	6	6	4	...	4	3	3	
Gunners	49	43	29	3	36	32	26	
Drivers	115	109	56	1	91	78	60	
Trumpeters	2	2	2	...	2	2	2	
Farrier-Sergeant	1	1	1	...	1	1	1	
Shoeing-Smiths	5	5	3	...	3	3	3	
Collar-makers	3	3	2	...	2	2	2	
Wheelers	3	3	2	...	2	2	2	
Total *Personnel*	202	190	108	10	156	136	112	
Public, Riding	*a* 23	*a* 23	*b* 21	6	19	17	17	(*a*) includes Majors' 2nd horse.
,, Spare	3	3	...	...	2	3	3	
Draught	188	178	80	2	148	124	88	(*b*) includes Majors' 2nd horse and 2 Veterinary officers'
,, Spare	18	16	12	...	16	12	12	
Total Horses	232	220	106	8	185	156	120	
Wagons, Amn. R.A.	6	10	6	...	...	...	...	
Carts, S. A. A.	10	2	8	...	...	...	...	
Wagon, A. and S. for Gun Amn.	6	10	...	...	9	15	6	
,, ,, ,, for S. A. A.	11	2	...	...	12	2	5	
,, ,, ,, for Store and Supplies	4	4	3	...	4	4	4	
Forge with Limber	1	1	1	...	1	1	1	
Forge Cart	...	...	...	1	...	...	...	
Spare Gun-carriage with Limber	1	4	1	...	...	...	...	
Total Carriages	39	33	19	1	26	22	16	

NOTE.—The numbers given for Ammunition Columns are those for service abroad.

It will be seen that Condition (1) is fulfilled by our allotment of Columns, somewhat after the same manner as in foreign armies.

Condition (2) is met by all sections of the Park being under command of one officer, a Lieut.-Colonel, Royal Artillery, save when detached.

Condition (3), we only carry enough rounds for what may be expected to be needed after three days' continuous fighting.

Condition (4) is arranged for; also Condition (5).

Condition (6) with regard to carriages: the majority are ammunition and store wagons, but in the divisional and Corps Troops Columns 2 artillery-ammunition wagons per battery to be supplied are allotted to each Column for rapid communication with the fighting line. Also a proportion of small-arm-ammunition carts, practically one per regiment (8 carts) without details and machine guns, for the same purpose.

If we examine the Cavalry Brigade Column we see that Condition (7) is met and only the supply wagons are of the heavier order.

Condition (8) is found in the Park.

With regard to (9) it will be seen that after allowing one gunner per carriage, there are 10 in excess in each Column or Section. When officers' servants and cooks have been deducted there will only be enough to allow of normal sick casualties. At a pinch, of course, there must only be one wagon man to every two carriages or less. The same applies to the drivers. If a heavy call on drivers arose, many of the gunners would have to be put up. The same principle has been applied to horses.

The arrangement in the Columns and section is agreeable to Condition (10). Save that there are four spare gun-carriages to supply 5 batteries in the Corps Troops Columns. Major Stone's figures surely show this to be excessive and 3 might well be dispensed with. Every carriage less in column of route is an advantage. If the severe strain on our 12-pr. carriages renders it necessary to have more spare, the Park would seem to be the place for them.

With regard to Conditions 11, 12 and 13, the number of carriages in each Column or Park shew this to be possible.

Take the divisional Ammunition Column and corresponding section of the Park:

The Column consists of—

Twelve wagons for gun ammunition.

Four wagons, supply.

One forge.

One spare gun-carriage.

These should form one section (in the battery sense) under a subal-

tern officer of three sub-divisions, also 21 carts and wagons for infantry ammunition. These should form the other section.

Thus :—

TABLE II.

Distribution of Carriages in Divisional Column.

	Right Section Artillery.			Left Section Infantry.		
	No. 1, Head-quarter.	No. 2.	No. 3, Mobile.	No. 4.	No. 5.	No. 6, Mobile.
Artillery Ammunition Wagons	...	...	6	...	...	...
Small-Arms Ammunition Carts	...	...	...	...	...	10
Wagons, Ammunition and Store	...	...	...	...	...	...
,, ,, ,, for Gun Ammunition	...	6	...	...	...	...
,, ,, ,, for Infantry Ammunition	...	...	...	5	6	...
,, For Supplies	4	...	...	...	...	...
Forge with Limber	1	...	...	...	...	...
Spare Gun-carriage	1	...	...	...	...	...
Total	6	6	6	5	6	10
Total per Section	...	...	18	...	...	21
Total per Column	...	...	...	...	...	39

The same system holds good for the Park, save that two "Gun Ammunition Wagons" would join the head-quarter sub-division (No. 1) to equalise number of wagons.

TABLE III.

(Divisional Section of Park 1st, 2nd and 3rd).

	Right Section.		Left Section.	
	No. 1 Head-quarters.	No. 2.	No. 3.	No. 4.
Wagons Ammunition and Store	...	...	...	...
,, ,, ,, for Gun Ammunition...	2	7	...	...
,, ,, ,, for Infantry Ammunition	...	...	6	6
,, For Supplies...	4	...	...	...
Forge with Limber	1	...	...	...
Total	7	7	6	6
Total per Section	...	14	...	12
Total per Park Section	...	...	...	26

All the Columns and Park Sections can be arranged on a similar system.

In the Cavalry Troops ammunition cart, the left section would contain all the mobile wagons, while in its Park Section, the only two wagons carrying small arms ammunition would be attached to sub-

divisions 2 and 4. The three axioms being (1) the two different ammunitions being, when possible, in separate sections; (2) the mobile wagons in separate sub-divisions; (3) the supply wagons altogether in one sub-division.

Cavalry Division Ammunition Column.

It will be noticed that no mention of a Cavalry Division Ammunition Column has been made. In the event of our needing one it would be organized from two Brigade Columns, cutting out one forge and spare gun-carriage and the staff of one Column and a few of the supply wagons.

Our Ammunition Park is only intended for service abroad, as at home we should always be in touch with the rail at short distances.

Out of the 16 cadres of Ammunition Columns, now maintained, nine are allotted to the divisions of 3 army corps, four to cavalry brigades, three for the corps troops of the three corps.

At present we have no cadres for the Parks, and for an expeditionary force mobilize our Ammunition Column cadres as Parks.

Now that the necessity of being prepared to send a large force to protect Canada has been demonstrated, besides being prepared to mobilise for home defence, the organization of Park cadres seems of considerable importance, so that a Park for one or two army corps could be despatched to Canada without using the Ammunition Column cadres of the corps remaining at home.

It will be at once evident that the organization of the British Columns and Park on paper practically fulfil all the requirements elicited from discussion of the question.

If, however, as the writer ventures to hope, he has noticed most of the points bearing on the subject, it is not surprising that this should be so, for our present Column and Park organizations have only been quite recently compiled, after study of foreign system, our own needs and the latest ideas on the subject. It should therefore be hard to prove the organization at fault, on entering into all the conditions affecting the constitution of such units.

The New Armament.

No allusion has as yet been made to the approaching armament of our field artillery with a heavier gun. The only effect such a step would have would be to increase the number of wagons in each Column and Park Sections, or to reduce the number of rounds to be carried in the Divisional Columns and corresponding sections. The Cavalry Columns would remained unaltered but the Corps Troop Column would require reorganization. It would be necessary to have one section in this Column for the Field Artillery, and one for the Horse Artillery ammunition, the two carts and two wagons carrying small arms ammunition forming one sub-division in the Field Artillery Ammunition Section.

The best way probably of allotting the ammunition for the new gun would be to let the supply, actually with the battery, accord with the capacity of the present number of wagons, while in the Columns and Parks carry the same proportions of ammunition as now, slightly increasing the number of wagons, ammunition and store per unit,

probably one wagon per unit per battery dependent on it. An increase in the weight of shell must mean a decrease in rounds carried with the first line, unless we can lessen the weight of our carriages.

General Remarks affecting Supply and Movements of Column and Park.

It now only remains to detail the general considerations bearing on the supply of the fighting line.

Tactics. As regards the tactics generally.—

Columns should march in rear of the combatant troops, in front of the baggage when an engagement is imminent.

When two or more divisions march by one road the corps commander must decide the position of his Columns.

The commander of a Column's chief idea must be to get to the front, when an action is pending and he must push up at all costs. The same applies in a less degree to the Park.

The Artillery Ammunition portion of a Column may, if a long artillery duel is anticipated and the roads are congested, push forward by itself, usually the small-arm ammunition carts and the artillery wagons should move straight off to the troops, the rest of the Column forming up within a mile of the first artillery position.

The commander of an Ammunition Column must at once inform the officer commanding divison and officer commanding divisional or corps artillery of his arrival and whereabouts. On halting near the front, a pole with distinctive coloured flag must be hoisted and at night a coloured lantern.

The officer commanding artillery also must keep a look-out to inform the officer commanding Columns of the artillery whereabouts.

Park. The Park will move intact when possible and if it can get up to the front during an action will park off the roads some three miles in rear and inform officer commanding army corps.

All Park Sections and Columns supply ammunition to any unit whatever in demand during an action.

Neither Park nor Column must have any regard to their own efficiency when supplying material or *personnel*, but must give all they can.

The routine for supplying must be of the simplest, a counterfoil delivery book being sufficient, a receipt being taken for everything on the counterfoil.

Columns *may* issue without written demand in action, but must take a receipt.

Empty small-arm-ammunition carts returning from the front should be collected in batches of five or six and be sent under a non-commissioned officer.

The officer commanding Park, if he judges fit, may send part of his wagons up to join the Columns when action is severe, or an advance in pursuit is anticipated.

As portions of Columns and Parks will continually have to find their way about country, each officer in a unit should be supplied with maps. It is important that the non-commissioned officers in a Column should

be able to read a map and in promoting men from batteries on mobilization this should be borne in mind.

The foregoing would seem to be the most important points with regard to the supply during an action and movements relating thereto.

Ammunition Columns in India.

Before closing, it may be worth noting that in India Columns for Artillery Ammunition are composed of three or four units, each according to the number of batteries dependant on the Columns.

Each unit consists of six artillery-ammunition wagons, the rough nature of the country in Afghanistan forbidding use of wagons, ammunition-and-store. One unit per Column has forge, store wagon I.P. and spare gun-carriage.

Six of these units are maintained, manned and horsed, attached to batteries in the Punjab, four more are kept ready packed in Ferozepur, Allahabad, Mhow and Bombay arsenals, while four units would be furnished by the field batteries of the Hyderabad Contingent.

This arrangement is very incomplete as compared with that in England, but is probably suited to the conditions of service beyond the frontier.

It would be a very great advantage if one Ammunition Column could be maintained fully equipped in England and if officers and non-commissioned officers could be continually attached for a month, or even a fortnight at a time, not only to render them acquainted with the work of a Column but with the whole system on which Columns and Parks are organized. There would then be a large number of officers and non-commissioned officers to select from for Column duty on mobilization.

The actual details of mobilizing would be very similar to those for a battery and do not seem to come within the scope of the present essay.

Postscript.

In submitting this essay the writer would ask that the difficulty of obtaining the latest figures and tables, when serving abroad, may serve as an apology for any minor errors in his tables purporting to be the present establishments of Columns and Parks.

AMMUNITION COLUMNS AND PARKS, CONSIDERED WITH REFERENCE TO THE REPLACEMENT OF AMMUNITION, HORSES AND MEN DURING AND AFTER AN ACTION.

BY

MAJOR E. S. MAY, R.A.

"THEY ALSO SERVE WHO ONLY STAND AND WAIT."

COMMENDED ESSAY, 1896.

SECTION I.

Introductory.

It is somewhat to be regretted that the above subject should have been chosen at this time for the Prize Essay, because it is believed that the organization of our Ammunition Columns is at the present moment undergoing alteration in accordance with the recommendations of a committee which has been considering the subject of ammunition supply during last summer. The recommendations of this committee were not, at the time of writing this essay, public property, and the writer, it is presumed in common with many others who may have taken up their pens, although private enquiry gave him some hints, was obliged to follow the tables given in the latest edition of field army establishment, the infantry and artillery hand-books for field service, and the authorized drill-books. It may possibly be therefore that before a few months are past, some of the data given may be inaccurate, and since the essay was written some of the changes foreshadowed by the introduction of the 15-pr. and H.A. gun have been indicated and tables modified accordingly. The principles, however, will remain the same, and it is not to be supposed that any vast alterations, such as would render his conclusions valueless, are likely to appear. He has been obliged to follow the existing state of things, and to take what is to

be found at the present moment with the seal of official authority upon it as a basis of discussion. With these few words of preface he will enter on his task.

That ammunition supply is an excellent subject for consideration now-a-days is most apparent. Men have of late years been so absorbed in the study of how to hit, that the equally important duty of how to supply has had perhaps less attention paid to it than it deserves. A battery in action, it should be remembered, is in the position of a struggling tradesman living on his capital. The greater efforts he makes to cope with the competition round him, the shorter time can he hold out. If success, even though it be already in sight, come not quickly, he may collapse from inanition, and, if he have no reserve fund to dip into, triumphant though he may have been up to a certain point, he must in due course of time find himself in the position of a clock run down, a steamer without coal, or a lamp without oil. At "ordinary fire" with the 12-pr., as we shall presently see, one ammunition box will feed one gun for about half-an-hour, and each gun has six boxes to call upon behind it. In three hours therefore—even under the normal conditions of the opening of a fight—the guns will have shot their last bolt.

Yet on the eventful 16th of August, 1870, some of the German batteries were in action the best part of twelve hours; one battery alone fired 1164 shells, and several others got rid of more than 1000 rounds. At Gravelotte, two days later, the consumption of ammunition was almost equally great, and the battery most heavily engaged expended very nearly 1000 projectiles. Now in our service each 12-pr. battery carries with it but 600 shell. It has, it is true, some case shot besides, but these, being useful only on particular and more or less exceptional occasions, may be left out of consideration. For ammunition beyond the amount just named, it must look to the Divisional Ammunition Column, which forms its first reserve, and which is toiling along weary miles of road behind it. If communication, rapid and effective, be not established and kept up between reserve and fighting line, the guns, ere the battle is half developed, may have to play the part of targets in place of engines of destruction. It is as necessary to practise officers and men in their duties connected with the renewal of ammunition to the pieces they fight, as it is to instruct them in the art of shooting straight or of manœuvring.

If arrangements are judiciously made and there be no mishaps, the wagons, which constitute the reservoir—or at any rate enough of them to tide over the difficulty—should arrive ere the guns have exhausted the stock they have with them, and there should be no break in the continuity of fire. The Ammunition Column should then be able to provide enough rounds for any battle for which artillery, judging by past experience, may be engaged. For an average expenditure of 1000 rounds per battery, although in 1870 it may have been exceeded in a few exceptional and isolated cases, is a sufficient estimate for what we may be called upon to face.

Battles, however, occasionally last for two days, and have even been protracted over several.

Essling and Wagram, for example, both extended over two. The great struggle at Gettysburg was not decided until three had passed. And when the Grand Duke of Mecklenburg-Schwerin faced Chanzy during the Orleans campaign, he had to rely on his guns to hold his ground against superior numbers for four exhausting days. A General should indeed feel ready for another battle, even when he has just gained a victory, and a second reserve of ammunition for his guns, called an Ammunition Park, has therefore to be provided behind that which is comparatively near at hand, and which has filled his boxes during the fight he has just survived. It is usually held a day's march behind the batteries in rear of the battle-field, and from it the empty wagons will be replenished during the night, so that at dawn the following day the guns may be able either to continue fighting or to move forward in readiness to meet a new foe.

In the case of an army corps organized for home defence, the arrangements are a little different. In place of an Ammunition Park we have a "Field Depôt," which would be located on a line of rail usually about a long day's march behind the fighting. It would in England be always possible to place this depôt on a line of railway, and therefore the wagons, horses and carriages which are required in the Ammunition Park are unnecessary and can be at any rate in part dispensed with.

SECTION II.

The Materials at Disposal.

Having said so much by way of introduction let us now consider exactly what materials we have to deal with in the field and how great are the responsibilities of an artillery officer in charge of Ammunition Columns or Parks.

An army corps is divided into three divisions and a proportion of corps troops. There is also a cavalry division or brigade to be considered.

Each of these bodies is supplied by an Ammunition Column, and these Columns in turn are filled up from a Section, in the case of service abroad, of the Ammunition Park. As has already been noted—field army establishments provide a "Field Depôt" to replace an Ammunition Park in the case of "Home Defence."

For convenience the Ammunition Column may be termed the first reserve, and the Ammunition Park the second reserve, of ammunition.

These reservoirs are placed behind what may be termed the fighting line, but within it there are minor reserves of ammunition also.

Thus, three wagons are placed between the guns of each battery while they are in action (battery reserve) and three wagons and six limbers per battery are placed some 200–400 yards behind them may conveniently be referred to subsequently as the "wagon line." Corresponding to these magazines, as they may be termed, in the case of

infantry we have the battalion reserve, analogous to the three wagons between the guns or the limbers, when "limber supply" is going on, and the brigade reserve, which is represented in artillery by the wagon line of a brigade-divison.

A tabular statement will perhaps render my meaning clearer.

1st Division.	2nd Division.	3rd Division.	Corps Troops.	Cavalry Division.
2 Brigades 1 Squadron Cavalry 3 Batteries	2 Brigades 1 Squadron 3 Batteries	2 Brigades 1 Squadron 3 Batteries	1 Battalion 1 Squadron 3 Batteries, R.H.A. *2 Batteries, R.A.†	2 Brigades Cavalry (6 Regts.) 2 Batteries, R.H.A. 1 Battalion mounted Infantry

1st Reserve	Divisional Ammunition Column	Divisional Ammunition Column	Divisional Ammunition Column	Corps Troops Ammunition Column	Cavalry Divisional Ammunition Column

AMMUNITION PARK.

2nd Reserve	1st Section	2nd Section	3rd Section	4th Section	5th Section

Note.—* In the case of home defence an additional battery is provided.

† The new organization for an army corps will give three Horse and six Field Batteries to the corps artillery.

The above table will place the organization of an army corps for service abroad, which we may accept as typical before my readers.

It is not thought necessary to give all the details of the minor units, such as machine gun sections,[1] bearer companies, etc., which go to complete the divisions, since these can be gleaned from "Field Army Establishments," and the broad principles of ammunition supply may be dealt with without entering into the excessive minutiæ which would otherwise be involved. It will, however, be desirable to now investigate the composition of these Ammunition Columns with reference to *personnel*, horses and carriages. These tables have likewise been abbreviated as far as possible.

1 It is intended to abolish these.

Infantry Divisional Ammunition Column.

	Officers.	Rank and file.	Horses.		
			Private	Riding.	Draught.
Major	1	...	1	1	...
Lieutenants	2	...	...	2	...
Sergeant-Major (W.O.)... ...	...	1	...	1	...
Battery Sergeant-Major ...	...	1	..	1	...
Battery Qr-Master Sergeant...	...	1	...	1	...
Farrier-Sergeant	...	1	...	1	...
Sergeants...	...	6	...	6	...
Shoeing-Smiths	...	5	...	1	...
Collar-Makers...	...	3	...	...	...
Wheelers	...	3	...	...	...
Trumpeters	...	2	...	2	...
Corporals	...	6	...	6	...
Bombardiers	...	6	...	...	...
Gunners	...	49	...	...	...
Drivers	...	115	...	...	188
Spare	...	...	...	3	18
Total	3	199	1	25	206

As regards carriages the following table gives the totals :—

Infantry Divisional Ammunition Column.

Carriages.

The changes due to the introduction of the 15-pr. are shown in block type throughout.

Transport.			No.	Drivers.	Draught Horses.	Remarks.
		Carriages, spare, gun, with limbers 12-pr.	1	2	4	* The 21 spare drivers accompany this column in charge of spare horses and as officers' servants and batmen.
		Carts, Small-arm ammunition...	10	10	20	
Wagons	Ammunition and store R.A	Ammunition with limbers, 12-pr.	6	18	36	
		15-pr.	**9**	**27**	**54**	
		for gun ammunition ...	6	18	36	
			3	**9**	**18**	
		for small-arm ammunition	11	33	66	
		for stores ...	1	3	6	
		for equipment and reserve rations ...	1	2	4	
		for supplies ...	1	3	6	
		for tents ...	1	2	4	
	Forge with limber, R.A...		1	3	6	
	Spare		...	*21	18	
		Total	39	115	206	

These and the subsequent tables are, it may be here noted, prepared from those given in "Field Army Establishments" for 1892, which is the latest edition which has been issued.

With reference to them it is to be observed that since there are three wagons between the guns of each battery in action, and three with the wagon line of each battery, or nine with the guns, and nine with the wagon line of a brigade-division, it would be better if there were nine ammunition wagons with each Divisional Ammunition Column, because such an arrangement would, as will subsequently be shewn, facilitate the system of sending supplies forward. The ammunition and store wagons for gun ammunition might then be reduced from six to three, which would leave us with nine ammunition wagons and three ammunition and store wagons per brigade-division, and it is believed that this will be the new arrangement when the 12-prs. are converted to 15-prs.

Under existing arrangements, however, the amount of ammunition with a Column is as follows:—

QUANTITIES CONVEYED IN.

Alterations for 15-pr. shown in block type.

		S. A. A. carts & A. & S. wagons	Spare gun carriage and limbers.	Ammn. wagons and limbers	A. & S. wagons	Total.	Remarks.
Cartridges.	Ball ·303 inch. ...	580800	...	...	...	580800	The 55 men armed with the M.H. carbines carry in addition 1100 rounds of carbine ammunition in their pouches.
	Ball M.H carbine	9000	...	...	...	9000	
	Ball Pistol	7680	...	...	...	7680	
	Gun Filled 12-pr.	...	36	432	864	1332	
	Gun " **15-pr.**	...	**46**	**936**	**432**	**1414**	
	Gun " 10 oz.	...	...	12	...	12	
Shells filled.	Common 12-pr. ...	...	8	72	168	248	
	15-pr. ...	...	**nil**	**nil**	**nil**	**nil**	
	Shrapnel 12-pr. ...	...	24	336	648	1008	
	15-pr. ...	...	**42**	**900**	**408**	**1350**	The 115 drivers armed with pistols carry 1380 rounds of pistol ammunition.
	Star	...	...	12	...	12	
Fuzes.	Shot case 12-pr. ...	...	4	24	48	76	
	15-pr. ...	...	**4**	**36**	**24**	**64**	
	Middle, sensitive, time No. 24	...	...	12	...	12	
	Percussion, small No. 8	...	12	72	168	252	* For long ranges.
	T. & P. Short No. 55	...	24	354	720	1098	
	T. & P. Middle No. 54	...	14	54	...	*68	
Tubes	Friction tubes...	...	75	450	1200	1725	

The *personnel* and horses of a Corps Troop Ammunition Column are as follows :—

CORPS TROOPS AMMUNITION COLUMN.

"Personnel."			Horses.		
			Private	Public.	
				Riding	Draught
Majors	1	...	1	1	...
Lieutenants	2	...	...	2	...
Sergeant-Major (W.O.)	...	1	...	1	...
Battery Sergeant-Major	...	1	...	1	...
Battery Quarter-Master Sergeant	...	1	...	1	...
Farrier-Sergeant	...	1	...	1	...
Sergeants	...	6	...	6	...
Shoeing-Smiths	...	5	...	1	...
Collar-Makers	...	3	...	...	...
Wheelers	...	3	...	...	...
Trumpeters	...	2	...	2	...
Corporals	...	6	...	6	...
Bombardiers	...	6	...		...
Gunners	...	43	...	...	...
Drivers	...	109	...	178	178
Spare	...	...	...	16	16
Total	3	187	1	25	194
	190		220		

The transport is as follows :—

CORPS TROOPS AMMUNITION COLUMN.

Alterations for 15-pr. shown in block type.

Transport,	No.	Drivers	Draught Horses	
Carriages, spare gun with limber	4	8	16	* The 20 spare drivers accompany this Column in charge of spare horses and as officers' servants and batmen.
	3	**6**	**12**	
Carts, S. A. A.	2	2	4	
Ammunition with limber, 12-pr.	10	30	60	
	24	**72**	**144**	
For gun ammunition	10	30	60	
	8	**24**	**48**	
" S. A. ammunition	2	6	12	
" Stores	1	3	6	
" Equipment and reserve rations	1	2	4	
For supplies	1	3	6	
" Tents	1	2	4	
Forge with limber, R.A.	1	3	6	
Spare	...	*20	16	
Total	33	109	194	
	42	**147**	**266**	

which carries the following amount of ammunition :—

CORPS TROOPS AMMUNITION COLUMN.

Ammunition.			S. A. A. carts and A. & S. wagons	Spare gun carriages	Ammn. wagons	A. & S. wagons	Total.	Remarks
Cartridges.	Ball	·303 inch.	88000	...	...	...	88000	The 49 men armed with carbines carry in addition 980 rounds of carbine ammunition in their pouches.
		M.H carbine	9000	...	...	...	9000	
		Pistol ...	13200	...	...	...	13200	
	Gun.	filled 12-pr.	...	144	720	1440	2304	
		15-pr. ...	...	**126**	**2496**	**1152**	**3774**	
		filled 10 oz.	...	...	20	...	20	
Shells filled.		Common 12-pr. ...	...	32	120	280	432	The 109 drivers armed with pistols also carry 1308 rounds of pistol ammunition.
		15-pr. ...	...	**nil**	**nil**	**nil**	...	
		Shrapnel 12-pr. ...	...	96	560	1080	1736	
		15-pr. ...	...	**126**	**2400**	**1152**	**3590**	
		Star 12-pr.	...	...	20	...	90	
		Shot case 12-pr. ...	...	16	40	80	136	
		15-pr. ...	...	**12**	**96**	**64**	**172**	
Fuzes		Middle, sensitive, time, No. 24 ...	...	...	20	...	20	* For long ranges
		Percussion, small No. 8	...	48	120	280	448	
	T. & P.	Short, No. 55	...	96	590	1200	1886	
		Middle, No. 54	...	56	90	...	*146	
		Friction tubes ...	...	300	750	2000	3050	

A Cavalry Divisional Ammunition Column is composed as follows as regards *personnel* and horses :—

CAVALRY DIVISIONAL AMMUNITION COLUMN.

"Personnel."			Horses.		
			Private	Public.	
				Riding	Draught
Major	1	...	1	1	...
Lieutenants	2	...	...	2	...
Sergeant-Major (W.O.)	...	1	...	1	...
Battery Sergeant-Major	...	1	...	1	...
Quarter-Master Sergeant	...	1	...	1	...
Farrier-Sergeants	...	1	...	1	...
Sergeants...	...	6	...	6	...
Shoeing-Smiths	...	5	...	3	...
Collar-Makers...	...	3	...	...	...
Wheelers...	...	3	...	...	...
Trumpeters	...	2	...	2	...
Corporals...	...	6	...	6	...
Bombardiers	...	6	...	6	...
Gunners	...	43	...	...	...
Drivers	...	89	...	6	136
Spare					16
Total	3	167	1	36	152
				189	

The Cavalry Divisional Ammunition Column would contain the following carriages. No alteration for 12-pr. of 6 cwt :—

CAVALRY DIVISIONAL AMMUNITION COLUMN.—CARRIAGES.

Transport.	No.	Drivers	Draught Horses	Remarks.
Carriages, spare, gun with limber, 12-pr.	1	2	4	The 21 spare drivers accompany this Column in charge of spare horses and as officers' servants and batmen.
Carts, ammunition, small-arm	15	15	30	
Wagons — Ammunition with limber 12-pr	12	36	72	
Wagons — Ammn. and stores, R.A. — For stores	1	3	6	
Wagons — Ammn. and stores, R.A. — For equipment and reserve rations ...	1	3	6	
Wagons — Ammn. and stores, R.A. — For supplies... ...	1	3	6	
Wagons — Ammn. and stores, R.A. — For tents	1	3	6	
Forge with limber, R.A.	1	3	6	
Spare	...	21	16	
Total	33	89	152	

The quantity of ammunition carried would be as follows. Alterations for 12-pr. 6 cwt. shown in block type :—

QUANTITY CARRIED IN.

Ammunition.	S. A. A. carts.	Spare gun carriage	Ammn. wagons	Totals	Remarks
Cartridges. — ·303 inch	132000	..	...	132000	The 49 men armed with the M.H. carbines carry in addition 980 rounds of carbine ammunition in their pouches.
Cartridges. — Ball — M.H carbine	69000	...	...	69000	
Cartridges. — Ball — Pistol ...	6000	...	...	6000	
Cartridges. — Gun — Filled 12-pr.	...	36	864	900	
Cartridges. — Gun — **12-pr. 6 cwt. ...**	...	**46**	**1104**	**1150**	
Cartridges. — Gun — Filled 10 oz.	...	...	24	24	
Shells filled. — Common 12-pr. ...	...	8	144	152	The 89 drivers armed with pistols also carry 1068 rounds of pistol ammunition.
Shells filled. — **12-pr. 6 cwt. ...**	...	**nil**	**nil**	...	
Shells filled. — Shrapnel	...	24	672	696	
Shells filled. — **12-pr. 6 cwt. ...**	...	**42**	**1056**	**1098**	* For long ranges.
Shells filled. — Star	...	...	24	24	
Shells filled. — Shot case 12-pr. ...	...	4	48	52	
Shells filled. — **12-pr. 6 cwt.** ...	...	**4**	**48**	**52**	
Fuzes — Middle, sensitive, time, No. 24 ...	...	...	24	24	
Fuzes — Percussion, small No. 8	...	12	144	156	
Fuzes — T. & P — Short No. 85... ...	...	24	708	732	
Fuzes — T. & P — Middle No. 54... ...	...	14	108	122*	
Tubes, friction... ...	...	75	900	975	

With reference to the organization of these Ammunition Columns it is further to be pointed out that no minor sub-divisions appear to be recognized in any of the tables given in "Field Army Establishments." In the "Handbook for Field Service, Field Artillery" (now more or less out of date), they are shown as sub-divided into two sub-divisions,

the first of which contains the ammunition wagons with limber according to the organization then in vogue, and ten S.A.A. carts, while the second was made up of the remainder. In Rothwell's "Lectures in Staff Duties" the Ammunition Column is also spoken of as sub-divided into two sections. The writer has had personal experience in tactical exercises when the general officer commanding of a corps has desired to divide the Ammunition Column owing to the paucity of roads leading to and from his position and it is conceivable that occasions may arise when it would be desirable to separate that portion likely to be most immediately in demand from the remainder. It is suggested therefore that a Column be sub-divided, or rather be ready to be sub-divided, into two portions, but the separation not to take place till necessary, and further into sections, each of which should provide for the particular need of one part of the division. Thus there might be one for the S.A. ammunition and one for each nature of gun.

And further, the sections might again be sub-divided, after the fashion in which a battery is split up, into sub-divisions each under a sergeant. Thus, taking the case of a Divisional Ammunition Column as an example :—

No. 1 Section.	No. 1 „ 2 „ 3	Sub-divisions might each consist of (in the case of the 15-pr.) three ammunition wagons and one A. and S. wagon with 24 horses.
No. 2 Section.	„ 4	Four S.A.A. carts and three A. and S. wagons with 26 horses.
	„ 5 „ 6	Three S.A.A. carts and four A. and S. wagons with 30 horses.

The remaining six carriages with their 30 horses might form a 7th sub-division under an additional sergeant and might belong to No. 1 section and form in rear of it on parade.

The precise form which the partition should take is a point which might after experiments be settled practically, and which has possibly already been settled, but it would appear desirable to tell off the spare gun carriage, the nine ammunition wagons (if that is to be the future number), and ten S.A.A. carts, together to form what might be termed an "emergency division" or fighting portion of the Column which could move more rapidly than the rest and could accompany the troops in the event of a forced march becoming necessary. The Ammunition Column may indeed be compared to a battery at war strength, and supervision and discipline will be facilitated if an interior organization and economy be established in it as much on the lines to which the *personnel*, being artillerymen, are accustomed as possible. Of course the wagons of this "emergency" division would always be kept full and ready to move.

They should in fact stand in the same relation to the fighting line, as the limbers of the brigade division do to the guns.

The Ammunition Columns we have just described should be brought within about a mile of the fighting line. Behind them, usually a day's march in rear would be the Ammunition Park, or in the case of home defence the field depôt. This Ammunition Park is divided into five sections, one for each infantry division, and a fourth for the corps

troops. There being five batteries at least with the corps artillery, and as in future there will be nine, this section carries more artillery, and less S.A. ammunition than the others. The fifth section, as has been said, is for the cavalry division.

It is to be noted that in future with 15-pr. and 12-pr. of 6 cwt. no common shell will be used, and therefore when they form the armament none will be carried with the Park.

The staff of the Ammunition Park, which is commanded by a Lieut.-Colonel, R.A., is as follows:—

REGIMENTAL STAFF OF AMMUNITION PARK.

"Personnel."				Horses.		
	Officers	Staff Sergt. Clerk.	Rank and File.	Total.	Private	Public. Riding	Public. Draught
Lieut.-Colonel	1	1	2	4	2	...	...
Adjutant R.A.	1	...	1	2	...	1	...
Medical Officer	1	...	...	1	1	...	...
Veterinary Officers	2	...	...	2	2	...	...
Driver	...	...	1	1	...	...	2
Total	5	1	4	10	5	1	2
	10				8		

A forage cart is attached to it also. The first three sections are thus composed:—

AMMUNITION PARK—1ST, 2ND AND 3RD SECTIONS.

"Personnel."			Horses. Public. Riding	Horses. Public. Draught
Captain	1	...	1	...
Lieutenants	2	...	2	...
Sergeant-Major (W.O.)	...	1	1	...
Battery Sergeant-Major	...	1	1	...
Battery Quarter-Master Sergeant	...	1	1	..
Sergeants	...	5	5	...
Farrier-Sergeant	...	1	1	...
Shoeing-Smiths	...	3	1	...
Collar-Makers	...	2	...	...
Wheelers	...	2	...	...
Trumpeters	...	2	2	...
Corporals	...	4	4	...
Bombardiers	...	4		...
Gunners	...	36	...	...
Drivers, Spare	...	91	2	148, 16
Total	3	153	21	164
	156		185	

AMMUNITION PARK—1ST, 2ND AND 3RD SECTIONS.—TRANSPORT.

Transport.			No.	Drivers	Horses	Remarks.
Wagons	A. & S. R.A.	For gun ammn.	9	63	126	* In charge of spare horses and as officers' servants and batmen.
		" S.A. ammn.	12	...	...	
		" Stores ...	1	3	6	
		" Equipment	1	2	4	
		" Reserve ...				
		" Rations ...				
		" Supplies ...	1	2	4	
		" Tents ...	1	2	4	
Forge with limber, R.A.			1	3	6	
Spare				16*	14	
Total			26	91	164	

Ammunition carried is as follows :—

Ammunition.			Total carried in A. & S. wagons.	Remarks.
Cartridges.	Ball.	·303 inches...	465300	The 40 men armed with carbines carry in addition 800 rounds of carbine ammunition in their pouches.
		M.H. carbine	3000	
		Pistol	960	
Shells filled.	Gun.	Filled 12-pr.	1296	
		Common 12-pr....	252	
		Shrapnel 12-pr....	972	The 91 drivers armed with pistols also carry 1092 rounds of pistol ammunition.
Shot case 12-pr.			72	
Fuzes.	Percussion, small, No. 8		252	
	T. & P. short, No. 55		1080	
Friction Tubes			1800	

The 4th section of the ammunition, as has already been stated, works in connection with the corps troops and is thus composed :—

AMMUNITION PARK—4TH SECTION.

"Personnel."		Horses.	
	Officers	Rank and file.	Riding	Draught
Captain	1	...	1	...
Lieutenants	2	...	2	...
Sergeant-Major (W.O.)	...	1	1	...
Battery Sergeant-Major	...	1	1	...
Battery Quarter-Master Sergeant	...	1	1	...
Sergeants...	...	4	4	...
Farrier-Sergeant	...	1	1	...
Shoeing-Smiths	...	3	1	...
Collar-Maker	...	2	...	...
Wheelers	...	2	...	...
Trumpeters	...	2	2	...
Corporals	...	3	3	...
Bombardiers	...	3		...
Gunners	...	32	...	...
Drivers	...	78	...	124
Spare	...	3	3	12
Total	3	133	20	136

The transport is as follows :—

Transport.			No.	Drivers	Draught Horses	Remarks.
Wagons	A. & S. R.A.	For gun ammn.	15	51	102	* In charge of spare horses and as officers' servants and batmen.
		" S.A. ammn.	2			
		" Stores ...	1	3	6	
		" Equipment	1	2	4	
		" Reserve ...				
		" Rations ...				
		" Supplies ...	1	2	4	
		" Tents ...	1	2	4	
Forage with limber, R.A.			1	3	6	
Spare			...	15*	10	
Total...			22	78	136	

The ammunition carried is as follows :—

Ammunition.			Number.	Remarks.
Cartridges.	Ball.	·303 inch.	73730	The 36 men armed with carbines carry in addition 720 rounds of carbine ammunition in their pouches.
		M.H. carbine	3000	
	Gun.	Pistol	960	
		Filled 12-pr.	2160	
Shells filled.	Common 12-pr.		420	
	Shrapnel 12-pr.		1620	The 78 drivers armed with pistols also carry 936 rounds of pistol ammunition.
Shot case 12-pr.			120	
Fuzes.	Percussion, small, No. 8		420	
	T. and P. short, No. 55		1800	
Friction tubes			3000	

The 5th section Ammunition Park works in connection with the cavalry division, and is thus composed :—

5TH SECTION AMMUNITION PARK.

"Personnel."	Officers.	Rank and file.	Horses.	
			Riding	Draught
Captains	1	...	1	...
Lieutenants	2	...	2	...
Sergeant-Major (W.O.)	...	1	1	...
Battery Sergeant-Major	...	1	1	...
Quarter-Master Sergeant	...	1	1	...
Sergeants...	...	4	4	...
Farrier-Sergeant	...	1	1	...
Shoeing-Smiths	...	3	1	...
Collar-Makers...	...	2	...	...
Wheelers	...	2	...	...
Trumpeters	...	2	2	...
Corporals	...	3	3	...
Bombardiers	...	3		
Gunners	...	26	...	...
Drivers } Spare }	...	60	3	88
Total	3	109	20	100

The transport is as follows :—

Transport.			No.	Drivers	Draught Horses.	Remarks.
Wagons	A. & S. R.A.	For gun ammn.	6	33	66	* In charge of spare horses and as officers' servants and batmen.
		" S.A. ammn.	5			
		" Stores ...	1	3	6	
		" Equipment				
		" Reserve ...	1	2	4	
		" Rations ...				
		" Supplies ...	1	2	4	
		" Tents ...	1	2	4	
Forge with limber, R.A.			1	3	6	
Spare			...	15*	10	
Total...			16	60	100	

The amount of ammunition conveyed is as follows :—

Ammunition.			Number	Remarks
Cartridges.	Ball.	·303 inch.	137500	The 30 men armed with carbines carry in addition 600 rounds of carbine ammunition in their pouches.
		M.H. carbine	33000	
		Pistol...	720	
	Gun.	Filled 12-pr.	864	
Shells filled.	Common 12-pr.		168	
	Shrapnel 12-pr.		648	
Shot case 12-pr.			48	The 60 drivers armed with pistols also carry 720 rounds of pistol ammunition.
Fuzes.	Percussion, small, No. 8		168	
	T. and P. short, No. 55		720	
Friction tubes			1200	

Such being the items over which he has control, let us now see how they can be dealt with most effectively.

SECTION III.

Recapitulation of Tables.

It will be convenient to briefly summarize the accumulation of data which the foregoing tables present us with, and to place them in a somewhat more digestible form before my readers.

The method of supplying ammunition within the battery does not form part of our task for discussion in this essay, and it is presumed that artillery officers are familiar both with the system now in vogue, and also with the resources they may look to within a battery itself. It may, however, not be amiss to recapitulate a few facts which should always be borne in mind.

Assuming the existing organizations and equipments as a basis of discussion, an officer has with his battery 108 rounds.

They are carried in six boxes, two on the gun limbers, two on wagon limbers, and two on wagon body. As a general rule, when

the rate of fire is ordinary, it may be assumed that a box of ammunition will last half-an-hour.

The first line of wagons will therefore last one hour.
The second „ „ „ „ „
The gun limbers „ „ „ „ „

The battery could, therefore, in an emergency, fight for three hours[1] without having to call upon an Ammunition Column at all. But it is not intended that it should do this, and it would rarely, or never, if arrangements were judicious, have thus to stand alone.

Nevertheless this supply for three hours' ordinary fire with the guns forms the special care of the battery commander, or in the case of three, of the brigade-division leader. He is responsible for the expenditure of those 108 rounds per gun.

We shall presently see what an infantry officer of similar position is responsible for. Meanwhile I may add that according to the tables I have given previously, the 18 guns of a brigade-division can count on 1332 rounds (with 15-pr. **1414** rounds), that is to say, 248 common shell, 1008 shrapnel, and 76 case shot (with 15-pr. **1350** shrapnel and **64** case shot) with the Column immediately behind it; or, in other words, there being 18 guns or 74 rounds per gun (with 15-pr. **78** rounds per gun).

The Corps Troops Ammunition Column would similarly supply its five batteries with 2304 rounds, namely, 432 common shell, 1736 shrapnel, and 136 case shot. There being 30 guns to be supplied we find that there will be 76 rounds per gun in this case.

Under new scheme **nine** batteries with **3774** rounds, namely, **nil** common shell, **3590** shrapnel, and **164** case shot. There being **54** guns to be supplied we find that there will be **70** rounds per gun in this case.

With the 1st, 2nd and 3rd sections of the Ammunition Park there are, according to the tables already given, 252 common shell, 972 shrapnel, and 72 case shot. This produces a grand total of 1296 rounds, which gives us a total per gun of 72 rounds.

With the 4th section of the Ammunition Park there are 420 common shell, 1620 shrapnel, and 120 case shot. In all 2160 rounds. There being usually 30 guns with the corps artillery we again arrive at a total of 72 rounds per gun. To summarize, and adopting round numbers (we may leave case shot out of our calculation as it is only for use on special occasions) :—

There are with each divisional battery, 100 shell.
1st Reserve... ... ... 70 „
2nd Reserve ... ... 70 „

and in round numbers the supply of shell with the corps artillery amounts to just the same proportion per gun as in the other cases.

The important question to decide now is, how long is such a supply likely to last ?

---

[1] With the 15-pr. equipment it will be able to fight for more than four hours.

The rough rule is that with ordinary fire one box (18 rounds) lasts half-an-hour, *i.e.*, 36 rounds lasts one hour.

Therefore—

The battery supply lasts			3 hours.
„	„	„	4 „
„	1st Reserve	„	2 „
„	2nd „	„	2 „
		Total	... 7 hours.
		„	... 8 „

It being considered that the *average* total fired by each gun would probably never be as high as 240 rounds in any battle, this supply ought to be sufficient, and it is to be remembered that although Ammunition Columns are primarily intended for particular troops, they are never to refuse a supply to any one in need of it.

Having thus shown the position a brigade-division commander stands in with regard to his own responsibilities, and to the assistance he has behind him, I will briefly indicate how an infantry leader of similar status is situated.

Of Lee-Metford rifle small-arm ammunition there are taken into the field for each infantry soldier :—

100	rounds	carried by the soldier.	
65	„	in four S.A.A. carts and on two mules accompanying the battalion.	Battalion Reserve.
20	„	in the battalion baggage wagon	Battalion Reserve.
Total...185			
77	„	in the Divisional Ammunition Column.	
60	„	in the Ammunition Park.	
Total...322			

The officers commanding battalions are responsible for the 185 rounds per man in battalion charge. The artillery officers in charge of the Column and Park are responsible for the remaining 137.

The position of the Ammunition Columns and Park are determined by General officers commanding divisions and army corps respectively. It is the duty of commanding officers, however, to keep themselves informed as to the whereabouts of these columns.

Behind the battalion will usually follow two S.A.A. carts and two mules, and they will form a battalion reserve which corresponds to the wagons which are placed between guns in action. The remainder of S.A.A. carts, that is to say, two per battalion and the battalion baggage wagon, will follow the brigade generally, and will constitute a reservoir which corresponds with the "wagon line" of a brigade-division of

artillery. This reservoir will be spoken of subsequently as the "brigade reserve."

We have therefore—

Battalions	Batteries
Battalion reserve (Two S.A.A. carts, two mules per battalion).	Battery reserve (Three ammunition wagons per battery).
Brigade reserve (Two S.A.A. carts per battalion).	Wagon line of brigade-division (The limbers and remaining wagons of all the batteries).

Divisional Ammunition Column.

Ammunition Park.

The duties of an artillery officer who is in charge of an Ammunition Column cease when he has handed over the ammunition to the "brigade reserve" or the "wagon line." We need not here, therefore, enter into the question of its distribution after that point. It is, however, laid down that all battalion ammunition transport when emptied, must at once proceed to the nearest Divisional Ammunition Column to refill, and then return without delay to its position in rear of the troops engaged.

SECTION IV.

Rules for the Guidance of Officers with Ammunition Columns.

The following general rules and memoranda are suggested for the use and guidance of officers who may have to deal with the question of ammunition supply.

The Ammunition Columns follow their divisions at a distance which is decided by the General officer commanding; if there is more than one division on a single road it will have to be decided by him whether each Column will follow its own division, or whether all are to move in rear of the whole force.

On the eve of, or during an action, Ammunition Columns must be pushed up to the front, and should endeavour to get within about a mile of the position which the guns may first take up.

Owing to the avenues of approach being very likely few in number, and movement off them in a close country impossible, or if they should become at all blocked or congested with traffic, or to facilitate retreat in the event of an obstinate stand not being intended, it will sometimes be desirable not to send the whole Column on all the way. In which case a portion might be selected on the principle already indicated and be pushed on while the remainder is held somewhat further to the rear.

It is to be remembered that an Ammunition Column for a division will require close upon half-a-mile of road when it is in column of route, and that in a close country such as England, a column of that length would often not find it easy to make its way to the front along a road

which was being also made use of by other troops.

As the Ammunition Park is a whole day's march behind the division, it is enough to say, with reference to the space it will occupy, that as a rough rule 20 yards may be allowed for every vehicle—this including intervals.

If the Ammunition Columns be far to the rear it may be necessary for them to move forward during the night.

Since a battery in action has with its guns usually three ammunition wagons, and the other three under cover, forming what may be termed the battery reserve (or where a brigade-division is engaged the brigade-division reserve and which I have spoken of as "the wagon line"), it is a convenient arrangement that each battery should have a reservoir in the Divisional Ammunition Column of three ammunition wagons, which three are to be regarded as interchangeable with the other sets of three which are in the front. As an addition one ammunition and store wagon packed with ammunition should be provided for each battery and therefore the brigade-division of three batteries can rely on nine ammunition wagons and three ammunition and store wagons with the column behind it.[1]

I may now indicate more closely the special duties which will fall to an artillery officer who finds himself in command of one of these Ammunition Columns.

But before entering into detail it is desirable to lay it down as strongly as possible that the guiding principle of his conduct should be that the supply is to flow from *rear to front*, that full wagons or carts are to be sent forward to take the place of emptied ones, rather than that the reverse process is to be adopted.

It is probable that while still on the line of march the sound of firing or messengers will apprise him of the fact that the unit to which he belongs is deployed, or about to deploy for action. He must then at once send off some of the mounted orderlies which are at his disposal to find out whether ammunition is needed, and also to bring back word as to the position of the unit which he is to supply, and open up connection with it. A general direction only will often be given, and it will frequently be no easy task to lead the wagons expeditiously to the place where they are needed. Therefore these orderlies, who are presumably intelligent men, and who, as they move, will study the lie of the ground as much as possible, having ascertained what they wanted to know, should without delay return to the Ammunition Columns, and be prepared to act as guides to those who may be ordered to lead forward the supply.

Until the officer commanding an Ammunition Column is quite certain of the exact position in action of the brigade-division and infantry which he has to supply he should not leave the road. Because if he does so, it may not be easy for an orderly charged with a message to him to find him. But, when he knows exactly where he has to go to, he should move by the shortest route, and across country, if the nature of it is such to allow of the free movement of wheeled carriages. Unless he has reconnoitred the path he intends to pursue he had better, how-

[1] This is the arrangement which will be carried out with the new 15-pr. equipment.

ever, usually be circumspect in leaving roads.

His Column, when it takes up its position, should not do so on a road, and should assume such a formation as will facilitate the exchange of wagons and render repacking easy.[1]

Opportunity should also be taken to break down fences, fill up, or bridge a path across ditches such as may be useful to the wagons when they again have to make their way to the road and generally make any preparations which may be possible in anticipation either of a sudden forward movement or one to the rear.

Usually it may be supposed that there will be time for the Ammunition Column to form up before its wagons are called upon, but in any case the system of sending forward supply would be the same whether from the line of march or from a position.

While the Ammunition Column is forming up, the first care of the officer in command of it should be to establish communication with the wagon line of the artillery, or, in the case of infantry, with the brigade reserve. It might often be possible to do this by means of signalling, and such a method should be striven for in the first instance. But on the battle-field vision is often obscured, and messengers must in such cases replace flags.

Further, the officer in command of an Ammunition Column, whether belonging to an infantry or cavalry division, must bear in mind that he is responsible that the guns and rifles engaged are fed with shells and bullets. He is to accept that responsibility frankly, and is to arrange direct with the officers who are in charge of artillery wagons, or infantry brigade S.A.A. carts, and he is not to seek instructions or orders from officers of higher authority. The tactical situation will engross all the time and attention of these, and there is no need to trouble them with unnecessary details.

Should a demand for artillery ammunition come back from the front, three artillery ammunition wagons per battery (nine per brigade division) should be sent ahead to the spot where the wagon line is placed. It will be desirable, whenever possible, to send an officer with them, and wagons going and returning should be instructed to move when possible at a trot. On reaching their destination the procedure should be as follows :—

The horses belonging to the Column should be unhooked and harnessed into the emptied wagons, and should take these to the rear under charge of the officer of an Ammunition Column, who will on his return set to work to repack them from the supply carried by the ammunition and store wagons.

There will be a number of arms and kits on all the wagons and it will be necessary that these should be exchanged between the batteries and the column at the same time as the horses, otherwise much inconvenience and discomfort may be brought about.

The orderly, who acted as messenger from the column, had better remain with the officer who is in charge of the wagon line, as he knows

[1] A rendezvous formation, such as a line of columns of sub-divisions or sections, would be a suitable one.

best where to find the Column and his services may again be needed when another call on the reservoir has to be made.

The principle is precisely the same where a question of supplying small-arm ammunition is concerned. When the demand is received, the officer in command of the Ammunition Column should send forward one S.A.A. cart per battalion (or 4 per brigade) to the brigade ammunition reserve of each brigade which is in need. Again, the services of an officer to lead them should, whenever possible, be utilised.

The horses belonging to the Column should be unhooked and put into the emptied carts as in the previous case, and these should, as before, be led back by the officer of the Column and refilled from the ammunition and store wagon. It will not be necessary to exchange arms or kits in this instance, because the S.A.A. carts should be unencumbered by such things.

The guide or messenger from the Column should remain with the brigade ammunition reserve during the action as in the case of the artillery.

Habits and ideas acquired in peace time are not readily shuffled off on active service, and difficulties might be made as to requisitions or vouchers, for which men are taught to entertain a pedantic veneration and respect in barracks. But no such things are necessary in the presence of the enemy, the Ammunition Column need ask for no formal requisition, a simple receipt for the number of full wagons or carts handed over will be prepared and accepted by the officer commanding it, these, when duly signed by the officer who receives the ammunition, will be all that is required.

It is not part of the duty of an officer commanding an Ammunition Column to keep an account of all the rounds which may be expended, that duty, should it be imposed upon him, falls to the share of him who leads the guns or rifles firing on the enemy, and his casualty returns can furnish the information.

The commander of an Ammunition Column should also practise his men in the duties which they will have to do in the field. They should thoroughly understand the nature of the various kinds of ammunition carried, and should be taught to pack and unpack it rapidly, and to shift it from one wagon to another. A regular system, akin to drill, with this end in view, should be established and every opportunity taken to exercise the men at it.

On the other hand it devolves on the senior captain in the case of a wagon line of a brigade-division, or of the officer in charge of the brigade reserve in that of infantry, to endeavour to open up communication from his side by means of signallers with the Ammunition Column.

He should take the earliest opportunity to replace empty wagons or S.A.A. carts with full ones from the Column and the officer commanding the Column ought to be kept informed of the number of empty wagons or S.A.A. carts there waiting till full ones can take their place. In the case of infantry it is of course the duty of the brigade staff to ensure that the empty battalion transport is duly replaced from the brigade reserve, but to save time battalion transport should, in an emergency,

be allowed when empty to proceed direct to the Divisional Ammunition Column to refill, and then return to its position in rear of the troops engaged.

All S.A.A. carts should be available for the brigade generally, and should not be looked upon as the peculiar property of any particular battalion.

Similarly the aid of Ammunition Columns or Parks is not to be limited to batteries of their own unit. The utmost liberality of action should here be exercised, and ammunition, men, stores, or horses freely given or received during an action from any Ammuuition Column which may be at hand.

As regards captains in charge of an artillery line of wagons of officers in a similar position with the brigade ammunition reserve there are a few more matters to be noticed.

The position of the wagon line as regards the guns, or of the brigade ammunition reserve as regards the firing line in the case of infantry, is dealt with in the drill-books of those arms, and it is not necessary therefore here to discuss points with reference to distances or cover. It may be mentioned, however, that empty wagons should be kept with the wagon line and empty S.A.A. cart with the brigade reserve, until full ones to take their place have come up from the Column.

It will tend to order and regularity, and will facilitate the labour of the men if, when full wagons are approaching a "wagon line," N.-C.O.s are sent to meet and lead them directly alongside the exhausted wagons which are to be taken away. Confusion and delay will thus be obviated, and the exchange of horses, mens' kits and arms will be rendered more easy.

It will also be advisable, except in a case of great emergency, to keep the men and horses of a Column from becoming mixed up with those of either the brigade-division or the infantry brigades. Men and horses from the Column should therefore not be allowed to advance beyond the wagon or brigade reserve line.

Ammunition Parks.

It is the duty of an officer commanding an Ammunition Park to report the arrival and notify the position of his Park to the C.R.A. of the army corps, and to the officers commanding the Divisional Ammunition Columns. Constant communication with these officers should be kept up, and any changes in position should at once be made known to them. The Parks should be formed up off the roads, but close to them, and should supply all the deficiences which the Ammunition Columns are unable to satisfy, and should moreover keep the Columns replenished and fit for movement.

The empty divisional wagons will usually, it may be assumed, be sent back and filled up at the Park, but when time presses full wagons should be sent forward from the Parks on the same principle as the service will work between Divisional Columns and brigade divisions or reserves. The position of the Ammunition Parks will be determined by General officers commanding corps, who will act in conjunction with the officer commanding artillery on their staff.

SECTION V.

The Replacement of Casualties.

During the action captains of batteries will detail men and horses from the wagon line to replace all casualties with the guns, and should as far as possible send them to their own sections.

They will also, with the assistance of the medical officer, if it can be managed without interfering with the service of the guns, send back wounded to the wagon line, whence they will be removed to the dressing stations.

The officer commanding a Column or Park should entirely sacrifice the interests of his command in order to keep batteries efficient and therefore freely send horses, men or stores to the front as casualties occur, and thus keep the batteries able to move and fight. It may, however, happen that they will be so mauled that they will have to retire from the front to refit. This was the case at Gravelotte when some of the batteries of the 9th Corps had to be taken out of action for some hours. They were, however, refitted with horses from the Ammunition Columns, and by ten cart horses, which were taken from an adjoining farm.

It would be well if officers in command of Ammunition Columns arranged before horses and men have actually to be sent away, exactly who and what animals are to go. A certain number might be told off in reliefs so that no further consultation would be required when a demand was received. The best horses should be sent away first and also the men best fitted for duty with the guns. The men told off should thoroughly understand that they may be called upon to leave the Column suddenly, and that they are to take their arms and their kits with them.

It will be better to send a certain number forward in a body all at the same time, and not in driblets, while the men may probably conviently proceed at the same time as a relay of wagons, on which their kits can be carried, is going to the wagon line.

If the issue of the battle is a victory, there will probably be a considerable number of draught horses captured from the enemy which will reinforce the denuded Columns, and remounts may likewise be obtained by requisitioning, but in any case the guns are to be kept horsed and manned without any consideration as to how Columns are to get along in the future. As the Ammunition Columns and Park have a large number of gunners with them it will probably be possible to make good losses in the *personnel* as regards gunners easily enough. The limbers will probably not be subjected to the same fire as the guns and losses amongst drivers should be less heavy, and it would usually be possible to make them good in the same way.

Steps should be made towards making good losses in horses and *personnel*, stores and ammunition from the Park in rear, while the action is going on and, if it is likely to be a prolonged one, it will often be necessary to commence sending forward reinforcements during the day. The Parks will give to the Columns with the same unselfish hand that they did to the batteries. To make good the gaps in their own organization they must communicate with the advanced depôt on the line of communications.

After the Action.

As regards the duties which would have to be undertaken after the action is over, it has already been indicated that the Divisional Columns should during the fight replenish the brigade-division both in ammunition, stores, horses and men to the best of their ability. The Columns in their turn would expect and command similar assistance from the Ammunition Parks, and they should be filled up and refitted during the night so that they may be ready to move forward early the next morning. The Ammunition Parks must look to the Ordnance Store Department for a replenishment of ammunition and stores for themselves and to the officer commanding the line of communications for a reinforcement of men and horses.

The officer in command of the artillery of the corps will have to requisition the Ordnance Store Department for enough ammunition to fill up the Park belonging to his corps. It will therefore be the first duty of an officer commanding an Ammunition Park to communicate the C.R.A. after an action, let him know how he stands as regards ammunition, and inform him as to how much more is to be demanded.

There will be a remount depôt at or near the base and it will be necessary to communicate with it at once, and to report the loss of horses at the front, what steps have been taken to replace them, and how many more are likely to be required.

There will further be a sick horse depôt at or near the advanced depôt already spoken of. A demand should be first made on it for it will be prepared to receive and issue remounts when sent to the front, and at it sick or slightly wounded horses will be attended to. Horses not likely to recover should be destroyed.

That there is ample scope and verge for energy and skill on the part of officers in charge of Ammunition Columns will be evident from a perusal of this brief sketch of the duties which will fall to their share on active service. It is not possible to go very minutely into detail because much must always depend on circumstances, on the nature of the country operated in, on the period of the campaign (because during a protracted one we may be sure the normal condition of an Ammunition Column will become considerably modified) and on the situation of the hour; but enough perhaps has been said to give a man unaccustomed to the work some notion, both as to what he may have to do, and how he may with most facility do it.

In conclusion it may be well to add that the work with such a Column, if less stimulating than that with the fighting line, is every whit as useful. Let no man therefore despise a position in which he may play a *rôle* no less honourable and valueable than his comrade further to the front. To feed an army and supply it is as difficult and as important as to lead it skilfully. "I do not know if I am a good General" said the great Duke once, "but I am sure that I am a good Commissariat officer." A man may similarly plume himself on his conduct of an Ammunition Column; it may be due to his care and forethought as much as to anything else that the issue of the day has been successful, and at its close he may reflect with satisfaction that—

"THEY ALSO SERVE THAT ONLY STAND AND WAIT."

ABSTRACT OF THE PROCEEDINGS

OF THE

FIFTY-NINTH ANNUAL GENERAL MEETING

OF THE

ROYAL ARTILLERY INSTITUTION.

The Meeting was held in the Lecture Theatre, Royal United Service Institution, Whitehall on Friday, 12th June, 1896.

Lieut.-General E. Markham, Inspector-General of Ordnance, took the Chair at 3 p.m. and asked the Secretary to read the Report as follows:—

The number of Members who have joined the Institution is twenty-six more than in the preceding year.

Lectures at out-stations

The chief extension of the use of the Institution has been the provision of lectures at large out-stations of a similar class to those given at Woolwich; those arranged were very successful but the new scheme of garrison instruction may possibly be found to interfere with their development, and the Committee have to be careful lest lectures be overdone and interest in them lost.

The lectures at out-stations were:—

At Dover, by Major W. D. Conner, R.E., on "Incidents of Bush Warfare."

At Dover, by T. M. Maguire, Esq., LL.D., on "Military Geography of Europe."

At Portsmouth, by Professor C. V. Boys, F.R.S., on "The Photographs of Bullets in Flight."

At Devonport, by Lieut.-Colonel C. M. Watson, C.M.G., R.E., on "The Nile and its Tributaries."

The Committee are much pleased that two out of the first four of these lectures should have been given by Officers of the Royal Engineers.

Lectures at R.A.I.

Nine lectures were given at the Institution. The Commander-in-Chief took the chair at Dr. Maguire's lecture on "Marlborough and his methods of warfare" and added greatly to its interest by narrating many little known details of the great Commander's life and characteristics. Captain Pilcher's lecture on "Artillery from an Infantry Officer's Point of View," was listened to by a very large audience and was followed by an interesting discussion. It is worthy of note that both Major May's lecture on "The Co-operation of Guns with Cavalry" and Captain Pilcher's, just mentioned, were afterwards given in Dublin to the Tactical Society of Ireland, and there met with due appreciation. Captain Du Boulay kindly consented to lecture on the Chino-Japanese War soon after his return from Japan; his lecture was given at the only "At Home" of the Committee last season and the theatre was so crowded that all standing room was occupied.

The following were the lectures and the dates on which they were given :—

"Okehampton 1895 and the progress there in recent years," by Captain J. Headlam, R.A., 7th October, 1895.

"Capillary Ripples," by Professor C. V. Boys, F.R.S., 7th November, 1895.

"Marlborough and his Methods of Warfare," by T. M. Maguire, Esq., LL.D, 30th November, 1895.

"Artificial Illumination, Gas and Electric," by Professor Carlton Lambert, M.A., 16th December, 1895.

"The Causes of Drift of Elongated Projectiles Fired from Rifled Guns," by Major-General C. H. Owen, late R.A., 3rd February, 1896.

"Optical Instruments and Silvering Glass Surfaces," by Dr. A. A. Common, LL.D., F.R.S., 13th February, 1896.

"Flight and Flying Machines," by Dr. G. H. Bryan, F.R.S., 27th February, 1896.

"Artillery from an Infantry Officer's Point of View." by Captain T. D. Pilcher, Northumberland Fusiliers, D.A.A.G., 12th March, 1896.

"The Chino-Japanese War," by Captain N. W. H. Du Boulay, R.A., 26th March, 1896.

Special Hon. Members.

The Committee have elected the following gentlemen in accordance with par. 3, Rule II., to be Honorary Members, viz :—

Field-Marshal Rt. Hon. Viscount Wolseley, K.P., G.C.B., Commander-in-Chief.

General Right Honourable Sir R. H. Buller, V.C., G.C.B., Adjutant-General to the Forces.

C. Dalton, Esq., F.R.G.S.

Publications.

As mentioned at the Annual Meeting last year the Committee have issued to every Member in pamphlet form a copy of "Twenty-four Hours of Moltke's Strategy," by Von Hoenig and, quite recently, "A Study of Shrapnel Fire," by Major-General Rohne, both translated from the German by Colonel N. L. Walford, D.I.G.O. The Committee feel that more justice is done to such valuable works by issuing them in this form than by publishing them bit by bit in the Translations at the end of the "Proceedings."

Gift.

Quite recently the Institution has received from Sir Collingwood Dickson, V.C., G.C.B., Colonel-Commandant, a present of the Imperial Eagle and N.N., removed from the flag-staff over the main gate of the Arsenal of Toulouse by the detachment of gunners under Sir Alexander Dickson, who went there in 1814 after the battle of that name to take charge of the ordnance.

Sir Alexander received permission from the Duke of Wellington to retain the Eagle which stands about 2′ 6″ by 2′ 6″ and is made of light iron painted bronze; Sir Collingwood now hopes that it may be suitably mounted and placed in the Institution Museum.

The Meeting unanimously agreed that a letter of thanks be sent to Sir Collingwood for his kindness in giving a present of such great historical interest.

Library. The Library continues to increase and, as in previous years, the Committee are anxious to have brought to their notice the name of any book likely to be useful to Members.

Electric engine. Through the kindness of Major H. C. L. Holden, F.R.S., R.A., the Committee have been able to acquire very cheaply an excellent gas-engine and dynamo which will save great expenditure in future lantern and electrical displays at lectures and will be available for the use of Members wishing to make electrical experiments or investigations.

Illustrations of R.A. dress. The question of publishing a book or series of plates illustrating the dress of all branches of the Regiment from the earliest date down to the present time has again been before the Committee and they are glad to say that there is at last a prospect of obtaining a really valuable work. Although there has been a delay of several years since first the question was mooted, it now seems as if the result will be much more satisfactory than if the scheme had been carried out in the first instance.

Kane's Lists. The Committee reported last year that they had received and made fair copies of all General Askwith's notes on Kane's List; this has enabled them to make an estimate of the cost of reproducing Kane's List corrected to date and containing the General's notes; the cost of an edition of say 2000 copies will be about £800 and the Committee now commend the matter to the officers of the Regiment for their consideration. It is thought that before expending so large a sum a guarantee should be obtained, that a reasonable proportion of it may be recouped. The Committee, at the same time, fully recognise the value of the work and the importance of its publication, if possible.

Rotunda Museum. Captain C. Orde Browne has continued his work on the figures of men in armour in the Rotunda Museum and when the two he is now finishing are complete there will be a collection of ten figures illustrating changes in weapons and armour from 1206 to 1650. These figures ranged on each side of the mounted "Bayard" clothed and armed as correctly as Captain Orde Browne's historical research and artistic workmanship can make them, will form a group worthy of the Museum.

Deaths. Among the deaths are to be noted the names of the following officers :—

Generals Sir J. W. Fitzmayer, K.C.B., Colonel-Commandant; the Baron de Teissier, Colonel-Commandant; H. P. Yates, C.B., Colonel-Commandant. Major-Generals C. T. Franklin, C.B., G. B. Shakespear, E. Atlay, C.B., the Hon. A. Stewart, H. Chichester, C. V. Cockburn, H. T. Molesworth. Colonels J. C. D'U. Murray, C. E. Newport. Lieut.-Colonels W. Riddell, E. W. Nash, A. W. Duncan. Majors J. M. Simpson, H. M. Sandbach, C. Jones, P. F. Hamilton. Captains A. G. Napier, J. F. L. Shepherd. Lieutenants A. S. Miller, A. A. Falcon.

Accounts. The general credit is nominally £2 less than last year but the Committee have written down the value of their stock of books on sale.

"Duncan" Gold Medal 1896. The subject of the Essays for the "Duncan" Gold Medal, 1896, was "Ammunition Columns and Parks, considered with reference to the replacement of ammunition, horses and men during and after an action."

Brig-General H. Pipon, Lt.-Colonel R. A. Montgomery and Major H. B. Jeffreys kindly consented to act as Judges. Ten essays were submitted and the Judges recommend that the writer of the Essay bearing the motto "Vigilentia non Cadet" be awarded the Gold Medal; that the writer of the Essay bearing the motto "Hold sure" be awarded the Silver Medal and that the writer of the Essay bearing the motto "They also serve who only stand and wait" be commended and the Essay be published.

The Secretary opened the sealed envelopes and announced that Captain J. F. Cadell, R.A. is the winner of the Gold Medal; Lieutenant G. F. MacMunn, D.S.O., R.A. is the winner of the Silver Medal and Major E. S. May, R.A. is commended.

Rewards for Papers.

Rewards for Papers—Col. G. J. Burgmann, Col. H. H. Knollys and Capt. A. Crawford, R.A., kindly consented to act as Judges and award amounts as follows:—

Col. F. T. Whinyates (late) R.H.A.	"Diary of Lieut. Swabey, R.H.A., in the Peninsular...	£6
Major H. C. C. D. Simpson, R.A.	"With the Mountain Artillery of France and Italy ...	£6
	Eastern and Western views of Mountain Artillery ...	
	Notes on German Siege Artillery and 4-gun Batteries	
Charles Dalton, Esq.	"Capt T. Brown, Chief Firemaster in the West Indies, 1693"	£4
	"List of the Artillery Company in Scotland at the time of the Union"	
Bt.-Lt.-Col. Adye, R.A.	"The Siege of Gibraltar"	£3
Major R. F. Johnson, R.A. ...	"The ammunition service of a Fort	£3
Major Stone, D.-A.-A.-G., R.A.	"The casualty returns of the German army at Colombey, Mars-la-Tour and Gravelotte"	£3
Lieut. C. G. Vereker, R.A. ...	"Torpedo-boat raids on harbours"	£2
Lieut. C. G. Stewart, R.A. ...	"The Relief of Chitral Fort"	£2
Colonel Turner, C.B., R.A. ...	"Notes on German Manœuvres"	£2
Major Hotham, R.H.A. ...	"A few hints on marching at home and abroad" ...	£2
Major May, R.A.	"The Operations of Wellington and Soult in 1809-12. Translated from the German"	£2
Capt. Headlam, R.A.... ...	"Okehampton in 1895 and its progress in recent years"...	£2
Major Blacker, (late) R.A. ...	"An adjustable Pointer for concentrating the fire of gun groups"	£2
Capt. Bethell, R.A.	"The Field Gun of the future." Translated from the German	£2

COMMITTEE. Committee.

Changes during the past year—

Lieut.-Colonel J. K. Trotter	vice	Captain A. Crawford.
Captain W. E. Fairholme	,,	Lieut.-Colonel J. K. Trotter.
Captain A. Crawford	,,	Major C. F. Hadden.
Major H. B. Jeffreys	,,	Lieutenant A. S. Buckle.
Major G. N. H. Barlow	,,	Colonel G. Burgmann.

It is now constituted as follows :—

PATRON AND PRESIDENT :

Field Marshal H.R.H. the DUKE OF CAMBRIDGE, K.G.

VICE-PRESIDENTS :

The Inspector-General of Ordnance.
The Deputy-Adjutant-General, R.A.
The General Officer Commanding Woolwich District.

MEMBERS :

The Assistant-Adjutant-General, R.A.
The Director, Artillery College.
The Assistant-Adjutant-General, Woolwich.
The Secretary, Ordnance Committee.

Col. R. D. E. Lockhart.
Lt.-Col. J. C. Dalton.
,, E. M. Baker.
,, E. T. Browell.
,, E. Blaksley.
Major A. C. Hansard.
,, G. N. H. Barlow.
,, H. B. Jeffreys.
Major H. C. Sclater.
,, E. S. May.
Capt. H. J. DuCane.
,, G. R. Darley.
,, Capt. A. Crawford.
,, Capt. W. E. Fairholme.
Lieut. L. R. Kenyon.

Bankers :

Messrs. Cox & Co., and London and County Bank.

Solicitor :

E. W. Sampson, Esq., Woolwich.

TRUSTEES :

General Sir C. Dickson, V.C., G.C.B.
,, Sir H. A. Smyth, K.C.M.G.
Lieut.-General R. P. Radcliffe.

Secretary :—Major A. J. Abdy.

General Markham in a few words pointed out the valuable work done by General Askwith in the matter of Kane's List and said it would be a good thing if the Committee could see their way to bringing out a new edition and, after expressing sorrow for the large number of deaths of officers Royal Artillery recorded last year, he asked if anyone had a question or remark to make on the Accounts and Report;

as no one rose they were put to the Meeting and unanimously adopted.

It was then proposed by Lieut.-Colonel J. R. J. Jocelyn, R.A., seconded by Lieut.-Colonel J. C. Dalton, R.A. and carried that a sum of £10 be granted to Mr. Thomas Rollands, School Green, Freshwater, Isle of Wight, formerly a musician in the R.A. Band, in consideration of the fact that the Institution had acquired possession of his father's Peninsular medal with 13 clasps without his benefitting in any way by its purchase. Colonel Jocelyn briefly described how a relation had treated Mr. Rollands in the matter and asked the Meeting to help him as an act of grace.

Two subjects were then chosen for submission to H.R.H., the President of the Institution, the one selected by him will be announced as that for the Duncan Gold Medal Prize Essay, 1897.

APPENDIX C.

Statement shewing Increase and Decrease of Members of the Institution during the year ending 31st March, 1896.

Ranks.	1st April, 1892.	Increase.			Total increase.	Decrease.				Total decrease.	Balance.		31st March, 1896.
		Promotions.	Retirements.	New Members.		Promotions.	Retirements.	Withdrawals.	Deaths.		Decrease.	Increase.	
EFFECTIVE LIST.													
Generals and Field Officers	431	34	—	—	34	—	27	1	2	30	—	4	435
Captains	444	41	—	1	42	34	7	1	2	44	2	—	442
Lieutenants... ...	650	—	—	88	88	41	2	—	4	47	—	41	691
Veterinary Surgeons	1	—	—	—	—	—	—	—	—	—	—	—	1
Quarter-Masters ...	1	—	—	—	—	—	—	—	—	—	—	—	1
Riding Masters ...	0	—	—	1	1	—	—	—	—	—	—	1	1
RETIRED LIST.													
Generals and Field Officers	183	—	25	—	25	—	—	14	9	23	—	2	185
Captains	78	—	7	1	8	—	—	4	—	4	—	4	82
Lieutenants... ...	19	—	2	—	2	—	—	3	—	3	1	—	18
Paymasters ...	2	—	—	—	—	—	—	—	—	—	—	—	2
Riding Master ...	1	—	—	—	—	—	—	—	—	—	—	—	1
Medical Officers ...	2	—	—	—	—	—	—	—	—	—	—	—	2
Chaplain	1	—	—	—	—	—	—	—	—	—	—	—	1
Honorary Members.	32	—	—	—	—	—	—	—	—	—	—	—	32
Totals ...	1845	75	34	91	200	75	36	23	17	151	3	52	1894

TION,

COME.

	£	s.	d.	£	s.	d.
.....	97	17	0			
.....	224	11	4			
els	29	0	0			
.....	1	12	4			
				353	0	8
.....	87	0	0			
				87	0	0
.....	1446	5	6			
.....	14	19	0			
				1461	4	6
come Tax.....				99	8	0
.....				1	9	8
the year ending 31st March, ...				2	3	1
				£2004	5	11

).

Cr.

	£	s.	d.	£	s.	d.
ling £300 on				491	0	7
Members on included in	121	3	1			
Members for d subscrip- Income.....	48	8	0			
				169	11	1
.....	42	3	7			
.....	55	8	5			
				97	12	0
ds at cost.....				3692	8	2
				£4450	11	10

e to be correct. The Assets, other than

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APPENDIX A.

GENERAL ABSTRACT
OF THE
ACCOUNTS OF THE ROYAL ARTILLERY INSTITUTION,
From 1st April, 1895, to 31st March, 1896.

EXPENDITURE AND INCOME.

1894-5 £	Expenditure.	£ s. d.	£ s. d.
137	Printing etc.: Wages—Compositors, &c.	138 1 9	
128	Printing etc.: Printing Accounts in aid of grants for publications	226 15 1	
139	Printing etc.: Folding, Stitching, &c.	125 1 9	
259	Printing etc.: Printing Materials	250 1 11	
144	Printing etc.: Wood Engraving and Lithography	192 7 6	
809			932 8 0
35	Classes		37 6 8
52	Lectures		134 2 3
340	Library and Books for sale		366 19 3
34	Museum		34 19 0
10	Observatory		11 11 1
23	Carpentry and Repairs: Wages	23 14 6	
34	Carpentry and Repairs: Materials	29 3 9	
58			52 18 3
10	Stationery		12 18 7
68	Postage and Parcels		102 15 2
153	Clerks and Orderlies: Wages	143 15 0	
8	Clerks and Orderlies: Clothing	15 9 0	
161			159 4 0
5	Subscriptions to Societies		5 5 0
31	Fire Insurance		33 7 0
25	Washing and Cleaning		28 1 8
16	Subscriptions refunded		15 4 6
4	Collecting Woolwich Bills, and Christmas Boxes		5 3 0
118	Medals, Honoraria and Rewards		72 2 6
1931			2004 5 11

1894-5 £	Income.	£ s. d.	£ s. d.
61	Amounts charged to Members for: Printing	97 17 0	
205	Amounts charged to Members for: Books, &c.	224 11 4	
22	Amounts charged to Members for: Postage and Parcels	29 0 0	
3	Amounts charged to Members for: Carpentry	1 12 4	
292			353 0 8
79	Entrance fees and Subscriptions for 1895-96.: Entrance Fees—Received	87 0 0	
79			87 0 0
1430	Subscriptions—Received	1446 5 6	
31	Subscriptions—Outstanding	14 19 0	
1461			1461 4 6
96	Dividend on Consols £3739 1s 9d less Income Tax		99 8 0
2	Interest on Bank Deposit Account		1 9 8
	Balance being excess of expenditure for the year ending 31st March, 1896		2 3 1
1931			£2004 5 11

APPENDIX B.

BALANCE SHEET.—31st March, 1896.

1894-5 £	Dr. Liabilities, &c.	£ s. d.	£ s. d.
138	To Sundry Creditors, viz.: Accounts for goods, Printing, &c., owing by the Institution and included in Expenditure for the year 1895-6	184 19 11	
11	To Sundry Creditors, viz.: Amount to Credit of Members on current Accounts	10 13 8	
149			195 13 7
24	" Members' Subscriptions paid in advance		20 17 0
173			216 10 7
	" Accumulated Fund—		
4096	Balance at 31st March, 1895	4236 4 4	
139	Less deficit on Expenditure and Income Account for year ending 31st March, 1896	2 3 1	
4236			4234 1 3
	N.B.—This Surplus is in addition to the value of the contents of the Museum and Library, Instruments, Furniture, Fixtures, &c., belonging to the Institution, which the Committee have estimated at £12,000, and which are insured for that sum in the Sun Fire Office.		
4410			£4450 11 10

1894-5 £	Assets.	£ s. d.	Cr. £ s. d.
483	By Cash in hand and at Bankers, including £300 on Deposit Account at interest		491 0 7
110	" Sundry Debtors, viz.: Amount owing by Members on current Accounts, included in Income	121 3 1	
57	" Sundry Debtors, viz.: Amount owing by Members for entrance fees and subscriptions included in Income	48 8 0	
167			169 11 1
31	" Stocks on hand, viz.: Printing paper	42 3 7	
34	" Stocks on hand, viz.: Books for sale	55 8 5	
65			97 12 0
3692	" Investments, viz.: £3739 1s. 9d. Consols at cost		3692 8 2
4410			£4450 11 10

AUDITORS' CERTIFICATE.

We have examined the above Accounts which are compiled from the Monthly Cash Accounts as audited by the Committee and find the same to be correct. The Assets, other than the Cash and Consols which we have verified, have been duly certified to us by the Officers of the Institution.

WELTON JONES & CO.,
AUDITOR

APPENDIX D.

Presentations to the Library.

Lithographs (Coloured)	R.C.D., 213, 216, 219, 220, 221, 222, 223, 225, 226, 227 and 28.	The Secretary of State for War.
	R.G.F., 156, 157, 158 and 159.	
	R.L., 223, 224, 225, 227 228 and 229.	
Lists of Service Ordnance, 1895, 6 copies...		
The Order of Field Service of the German Army and Appendix		
The Duties of the General Staff, 1895. ...		
Précis of Information Concerning Zululand, 1895		
Handbook of the Armies of Bulgaria, Greece, Montenegro, Roumania and Servia ...		
Army Annual Act, 1895		Deputy-Adjutant-General Royal Artillery.
Report on the new system for testing the Tactical fitness of Majors for command, 1895.		
Treatise on Military Carriages, 1894 ...		
Infantry Sword Exercises, 1895		
Financial Instructions, 1895		
Regulations for Recruiting, 1895		
Royal Warrant for Pay, Promotion, etc., 1895		
The Annual Statistical and General Report of the Army Veterinary Department, 1894-5		
Regulations for the Allowances of the Army, 1895		
Price List for Military Tailors, Royal Artillery		
Handbook of the Armies of Bulgaria, Greece, Montenegro, Roumania and Servia ...		
Arrangements for the Supply of Ammunition, Targets, and other Stores, for the Practice of Royal Horse and Field Artillery in Ireland, 1896		
Approved Arrangements for Siege Practice at Lydd, 1896		
Instructions for Siege Artillery Practice, 1896		
Regulations for the Volunteer Forces, 1895		
Regulations and Instructions for Encampments, 1895		
Garrison Artillery Drill, Vol. I., 1895 ...		
Regulations for the Equipment of the Regular Army, Part I., Sections 1—16, Peace		

Annual Report of School of Gunnery, 1895, Part I., (Coast), Part II., (Siege) ...	Deputy-Adjutant-General Royal Artillery.
Annual Report of School of Gunnery, 1895, Horse and Field Artillery at Home ...	
Arrangements for the Supply of Ammunition, Targets and other Stores, for the Practice of Royal Horse and Field Artillery in Great Britain, 1896	
Map of the Pamirs and Adjacent Country Intell. Div., No. 866a	Director of Military Intelligence.
Map of Madagascar, Intell. Div., No. 1084	
Map of Adjoining Provinces of Russia, China and Japan, Intell. Div., No. 1087 ...	
Map of British Central Africa, Intell. Div., No. 1092 (h).	
Map of Sweden and Norway, Intell. Div., No. 1105	
Map of the Gold Coast Colony, Intell. Div. No. 1097	
Examination Papers for Volunteer Artillery, Position Artillery, Nov. 1895	Director-General of Military Education.
Examination Papers R.M. Academy, February 1895, July 1895, and December 1895	Governor R.M. Academy.
Smithsonian Miscellaneous Collections, Nos. 854, 969 and 970	Smithsonian Institution.
Annual Reports of the Bureau of Ethnology, 1889-90 and 1890-1	
Contributions to North American Ethnology, Vol. IX....	
An Ancient Quarry in Indian Territory, by W. H. Holmes	
List of the Publications of the Bureau of Ethnology	
Archeologic Investigations in James and Potomac Valleys, by G. Fowke	
Chinook Texts, by F. Boas	
The Siouan Tribes of the East, by J. Mooney	
An Account of the Smithsonian Institution, its Origin, History, Objects and Achievements	
Index to the Literature Didymium 1842-93, by A. C. Langmuir, Ph. D.	
Indexes to the Literatures of Cerium and Lanthanum, by W. H. Magee, Ph. D. ...	
On the Densities of Oxygen and Hydrogen, and on the Ratio of their Atomic Weights, by E. W. Morley, Ph. D.	
General Regulations of the Bengal Army, 1855	Captain A. H. C. Dickinson, O.S.D.
Memoires D'Artillerie, Contenant L'Artillerie Nouvelle, etc.	Lady Lefroy.
Documenti Inediti per la Storia della Armi da Fuoco Italiane	

Photograph of Mr. Tom Mitchell's champion Yorkshire hackney "Ganymede" ...	Captain M. H. Hayes, late R.A.
The Royal Guernsey Artillery. A Brief sketch of its services from 800 to 1895, by Lt.-Colonel J. P. Groves	Lt.-Colonel J. P. Groves.
History of the 2nd Battalion Argyll and Sutherland Highlanders, by Lt.-Colonel J. P. Groves	
Report of the Chief of Ordnance, United States Ordnance Department, 1894 ...	Chief of Ordnance.
Proceedings of the Institution of Civil Engineers, Vols. 120, 121, 122 and 123 and Index to Vols. 59 to 118	Institution of Civil Engineers.
Catalogue of the Library of the Institution of Civil Engineers, 1895, 3 Vols. ...	
Examination Papers, Artillery College, 1894-5, 2 Copies	Director, Artillery College.
Report of the Astronomer Royal, 1895. ...	The Astronomer Royal.
Greenwich Magnetical and Meteorological Observations, 1892	
Three Private Letters from Persons of Distinction in the Army at Hanau, giving a Particular Account of the late Battle between the English and French Armies, d. 1743.	Charles Dalton, Esq., F.R.G.S.
Particulars of the Action at Dettingen, as contained in several letters from both Armies. d. 1743	
Two Authentic Letters from Field Officers in our Army, containing an account of the engagement between the two Armies on the Main, d. 1743.	
Papers of the Military Historical Society of Massachusetts, Vols. 1, 2 and 10 ...	Military Historical Society of Massachusetts.
Notes on the Outlines of Strategy, by T. M. Maguire, Esq., M.A., LL.D.	T. M. Maguire, Esq.
The Military Catechism, for the use of Young Officers and Sergeants, d. 1833...	Captain S. G. Horton, R.A.
Outlines of Modern Tactics, by Lt.-Colonel E. Gunter	Lt.-Colonel E. Gunter.
History of the Bengal Artillery, Vol. III., by Major-General F. W. Stubbs, late Bengal Artillery...	Major-General F. W. Stubbs.
Exterior Ballistics, by Col. N. Zaboudski, 1895, (Russian Edition).	Colonel N. Zaboudski.
Essai General de Fortification, par M. De Bousmard, 4 Vols., d. 1814	Colonel C. C. Trench, R.A.
The Great Art of Artillery, C. Simienowiez, translated from the French by G. Shelvocke, d. 1729	
Aperçu sur les Canons Rayés, par J. Cavalli, d. 1862	

Lessons to be Derived from the Operations of Landing an Expeditionary Force on an Enemy's Coast, etc., by Major F. B. Elmslie, R.A.	Major F. B. Elmslie.
Extracts from the Private Letters of the late Sir W. F. Cooke, 1836-39, relating to the Invention and Development of the Electric Telegraph	Colonel W. G. Andrewes, late R.A.
Proceedings of a General Court-martial held upon Lord George Sackville, d. 1760 ...	Major R. H. Murdoch, R.A.
Transactions of the Junior Engineering Society, Vol. IV.	Junior Engineering Society.
Fourth Report of the Canadian Bureau of Mines	L. H. Irving, Esq.
Lithograph (framed) of the "Church, Main Guard and R.A. Barracks at St. Thomas's Mount, India	J. T. Abdy, Esq.
A Copy of a Portrait (framed) of the late William Sturgeon	The Editor, *Electrician*.
The Mapping of Africa, by Lieut.-General E. F. Chapman, C B.	Lieut.-General E. F. Chapman, C.B.
A Year on the Punjab Frontier, 1848-9, 2 Vols.	Major J. H. Leslie, R.A.
Journal of the Iron and Steel Institute, Nos. 1 and 2, 1895	Iron and Steel Institute.
Supplement to a Revised Account of the Experiments made with the Bashforth Chronograph, by F. Bashforth, B.D. ...	Rev. F. Bashforth.
The Franco-German War, Part II., Secs. 14, 15 and 17	Captain A. S. Dunlop, R.A.
Analytical Index to the Franco-German War, 1870-71	
Plan de Paris, 1894	
Map of Eastern Turkey in Asia, by Capt. F. R. Maunsell, R.A.	Captain F. R. Maunsell.
The Structure and Function of the Horse's Foot, by Vet. Capt. F. Smith, F.R.C.V.S., F.I.C., A.V.D.	Vet. Capt. F. Smith.
The Refractive Character of the Eyes of Horses, by Vet. Capt. F. Smith, A.V.D.	
Construction der Kriegsführwerke, Von G. Kaiser	Austrian Militar Comité.
Photograph (c. de v.) of the late Louis, Prince Imperial, killed in Zululand, 1st June, 1879	H. Chamberlain, Esq., R.N.
Photograph of old Blandford Church, near Petersburg, Virginia, U.S.A., showing the angle of the ruins where General William Phillips, R.A., was buried in May, 1781.	F. R. Lassiter, Esq., Petersburg, U.S.A.
Netherlands Artillery Atlas, Plates 228-233	Netherlands Government.

Two Letters Relating to the Death of Lieut. Connol, R.A., in the Batteries before Badajos on 28th March, 1812	H. W. Estridge, Esq., late Lieut. 46th Foot.
Colonel West's Military Figures for the Practice of Tacticks, 1803	Colonel E. T. Browell, R.A.
Water colour painting in gilt frame, "A Native Fort at Uri, Kashmir," by Colonel A. Campbell, R.A.	Colonel A. Campbell.
Notes on Hindus and Sikhs, by Lieut. D. G. Seagrim, R.A.	Lieut. D. G. Seagrim.
Shadow Portrait of the late Lieut.-General Sir Wilshire Wilson, R.A., K.C.H. ...	Colonel C. E. S. Scott, late R.A.
Water colour painting in gold frame, "Evening," by Major-General T. A. de Moleyns, late R.A.	Major-General T. A. de Moleyns.
General Ballistic Tables for Mortar Firing, by Captain J. M. Ingalls, 1st U.S. Artillery.	Captain J. M. Ingalls.
Professional Papers of the corps of Royal Engineers, 1895, Vol. XXI.	R.E. Institute.

APPENDIX E.

Books, &c., Purchased.

Biologia Centrali-Americana, Zoology, Parts 121-128, Archœology, Part 5.
Puissance Militaire des Etats de L'Europe, par J. Mollard.
The Electric Current, how produced and how used. By R. M. Walmsley.
Water-colour drawing of a Trumpeter, Royal Artillery. Period 1840. By W. Heath.
Der Japanisch-Chinesische Krieg. By Von Kunowski und Fretsdorff. 2 Vols.
Franco-German War, 1870-71. Part I. Vol. 2. Maps.
La Défense des états et la Fortification à la fin du XIX.^{e} Siecle, par le Général Brialmont.
History of the Second Queen's, now the Royal West Surrey Regiment. By Lt.-Col. J. Davis. 3 Vols.
Napoleon Bonaparte's First Campaign. By H. M. Sargent.
General Craufurd and his Light Division. By Rev. A. H. Crauford, M.A.
The Liberation of Bulgaria. By Wentworth Huyshe.
Officielle Karte von Nord-Ostsee-Kanal.
Dislokationskarte der Heere Europas. Part IV.
Memoires de Barras, par George Duruy. Vols. 1 and 2.
The British Noctuœ and their varieties. 4 Vols.
The Military Miscellany, 1846. By H. Marshall.
Dislokations—Karten der Gesammten Russischen Armée.
Exposition Historique et Militaire de la Revolution et de l'Empire, par Germain Bapst.
Navy Records Society's Publications, "Index to James's Naval History"; "Letters of Sir Samuel Hood, (Viscount Hood)"; and "The Life of Captain Stephen Martin."
Nelson's Letters and Despatches. By J. K. Laughton.

L'Armée et la Flotte en 1894, par Ardouin-Dumazet.
Les Manœuvres de Forteresse, par Henri Mazereau.
Leçons D'Artillerie, par E. Girardon.
Catalogue of Birds in the British Museum. Vols. 1-23.
Dictionary of National Biography. Vols. 43, 44, 45 and 46.
Dictionary of Explosives, 2nd edition. By Lt.-Col. J. P. Cundill and Captain J. H. Thomson, R.A.
Militär Hand Worterbuch für Armée and Marine. Parts 1-10.
Schlachten Atlas. Parts 44-48.
Memoirs of the Extraordinary Military Career of John Shipp, late Lieut. 87th Regiment.
History of Afghanistan. By Col. G. B. Malleson.
Merv and the Man Stealing Turcomans. By C. Marvin.
Turkistan. By E. Schuyler. 2 Vols.
Central Asia, from the Aryan to the Cossack. By J. Hutton.
The Russian Campaign against the Turcomans. By C. Marvin.
The Merv Oasis. By E. O'Donovan. 2 Vols.
Travels in Central Asia. By A. Vambéry.
A ride through Islam. By H. P. Marsh.
Northern Afghanistan. By C. E. Yate.
The Life and Opinions of Major-General Sir C. M. Macgregor. 2 Vols.
The Campaign of the Cataracts. By Sir W. F. Butler.
From London to Bokhara and a ride through Persia. By Col. A. Le Mesurier, R.E.
History of Bokhara. By A. Vambéry.
A journey through Khorassan. By Major-General Sir C. M. Macgregor.
The Fall of the Mogul Empire. By H. G. Keene.
Wanderings in Baluchistan. By Major-General Sir C. M. Macgregor.
Campaigning on the Oxus and the Fall of Khiva. By J. A. MacGahan.
Reconnoitring Central Asia. By C. Marvin.
The Northern Barrier of India. By F. Drew.
Central Asian Questions. By D. C. Boulger.
Life of Yakoob Beg, Ameer of Kashgar. By D. C. Boulger.
England and Russia in Central Asia. By D. C. Boulger. 2 Vols.
Across Chrysê, from Canton to Mandalay. By A. R. Colquhoun. 2 Vols.
History of Gujarát. By Sir E. C. Bayley.
Decisive Battles of India. By Col. G. B. Malleson.
Analytical Index to Kaye's Sepoy War and Malleson's Indian Mutiny. By F. Pincott.
The Invasions of India from Central Asia.
Visits to High Tartary, Yârkand and Kashgar. By R. Shaw.
Turkish Armenia and Eastern Asia Minor. By Rev. H. F. Tozer.
Russia in Central Asia. By H. Stumm.
Five coloured prints of Royal Artillery uniforms at different periods.
The Records and Badges of the British Army.
Die Kriege Friedrichs des Grossen. Parts I. II. and III. Vol. 2.
Ballistique Extérieure, par E. Vallier.
Bouches à Feu, par Lt.-Col. Hennebert.
Carnet de l' Officier de Marine, 1895.
Buffon's Natural History. Plates. 2 Vols.
Map of the Curragh Manœuvres, 1895.
Operations of the Division of Military Engineering of the International Congress of Engineers.
Problems of the Far East. By Hon. G. N. Curzon, M.P.

Recollections of a Military Life. By General Sir J. Adye, G.C.B.
Dictionaire Militaire. Parts 3, 4 and 5.
Monograph of the Birds of Paradise. Part 5.
Kriegführung Kurze Lehre ihrer wichtigsten Grundsätze und Formen. By Von der Goltz.
Die Entscheidungskämpfe des Mainfeldzuges an der Frankischen Saale. By Fritz Hœnig.
Armour and its Attack by Artillery. By Captain C. Orde Browne, late R.A.
Publication of the Hakluyt Society, "Voyage of Pedro Sarminto."
The Naval Annual, 1895. By Lord Brassey.
The Structure and Life of Birds. By F. W. Headley, M.A.
Campagne de Maréchal Soult en 1813-14, par Le Commandant Clerc.
Haydn's Dictionary of Dates. 21st Edition.
Essays in Military Biography. By Col. C. C. Chesney, R.E.
James's Siege of Gibraltar. Maps.
The Military Operations at Cabul in 1842. By Lieut. V. Eyre.
The History of the Earls and Earldom of Flanders.
The Proceedings on the enquiry into the Armistice and Convention of Cintra. By J. J. Stockdale.
The History of the Campaigns of 1796 in Germany, Italy and Switzerland. 4 Vols.
Les Régiments D'Artillerie a Pied de la Garde et le 23e Régiment D'Artillerie, par E. Litre.
Tu Seras Soldat.—Histoire d'un Soldat Français, par Emile Larvisse.
Stratégie Gine Studie. By General-Major Blume.
Cawnpore. By G. O. Trevelyan.
Coloured print "South view of Corunna from the Heights near the Convent of St. Margaret," d. 1809.
Steel engraving "The Battle Taniéres near Mons in Flanders, 1709."
Mes Campagnes, par A. Guillaume.
Souvenirs et Campagnes 1804-1883, par le General de la Motte Rouge. 3 Vols.
Die Entscheidungskämpfe des General von Werder, im Januar 1871. By Major A. D. Kunz.
Le Premier Grenadier de France, la Tour d'Auvergne, par P. Dérouléde.
The Life of a Soldier, a narrative and descriptive poem. By W. Heath.
Histoire de Marlborough, Dessins de Caran D'Ache.
A Perambulation of the Royal Forest of Dartmoor. By S. Rowe, M.A.
Album Militaire. Parts 1-10.
Uniformenkunde, Lose Blätter zur Geschichte der Entwickelung der Militärischen.
Tracht in Deutschland. Vol. VI.
Construction der Kriegsführwerke. By Georg Kaiser.
Fabricaçion Descripçion y Calculo de Montajes.
The Field of Mars. 2 Vols.
Memoirs of the 10th Royal Hussars. By Col. R. S. Liddell.
L'Armée de John Bull. By Hector France.
Schools and Masters of Fence. By Egerton Castle.
Journal of the Waterloo Campaign. By General C. Mercer. 2 Vols.
Dictionary of Military Terms, English—French. Part I. By Professor Barrére.
Waterloo Memoirs. By 2 Vols.
The Battle of Waterloo. By a near Observer.
The Battles of Waterloo, Ligny and Quatre Bras. By G. Jones.
Français et Allemande. Vols. 5 and 6. By Dick De Lonlay.
Die Uniformen und Fahnen der Deutschen Armée. 2 Vols.
Der Alte Fritz in 50 Bildern für Jung und Alte.

The Military Panorama or Officers Companion. 2 Vols.
Die Schlacht von Noisseville. By Major A. D. Kunz.
Organization du Matériel D'Artillerie, par E. Girardon.
Le Musée D'Artillerie, par le Colonel Bernadac.
Practical Course of Instruction. By Lieut. R. Cockburn, R.A. 1830. M.S.
History of the Great Civil War, 1642-1649. By S. R. Gardiner. 4 Vols.
Stratégie et Grande Tactique, par Le Général Pierron Vol. 4.
Military Sketching made easy and Military Maps explained. By Major H. D. Hutchinson.
La Défense des Côtes, et les Têtes de Pont Permanentes, par Le Général Brialmont.
Histoire de Jean Churchill, Duc de Marlborough. 3 Vols.
Fire and Sword in the Sudan. By R. C. Slatin Pasha.
The Military Law Examiner. By Lt.-Col. S. C. Pratt, late R.A.

APPENDIX F.

Presentations to the Museum.

A Collection of Botanical Specimens from Scotland	Colonel J. S. Stirling, late R.A.
Hinge-pin from the principal doorway of Sandown Castle, Deal, supposed to be of the time of Henry VIII.	J. Watts, Esq.
A collection of shells of various descriptions....	Col H. S. S. Watkin, C.B., R.A.
Twelve specimens of various birds from New Zealand	Captain Hugh Stewart, late R.A.
Six stone implements from New Zealand ...	
Stone Image, from the Swat Valley, taken from an old Buddhist Temple, where the Guides Cavalry charge took place at the Action of Khar during the Chitral Expedition	Lieut. F. R. Patch, R.A.
Five English and Foreign Medals, viz :— England-Afghan War, 1842. Holland, 1813-15. Hanover, 1866. Turkey, Nischen-Iftihar. Chili, Campaign of Lima, 1881.	Colonel N. L. Walford, R.A.
Models of a field-gun and wagon, made by French prisoners of the Peninsular War.	Lieut.-Colonel T. H. Salt, late Bengal Artillery.

APPENDIX G.

List of Papers Published in the "Proceedings" during the Year.

Coast Artillery in Action. By Lieut.-Colonel J. R. J. Jocelyn, R.A.

Captain Thomas Brown, Chief Fire-Master in the West Indies, 1693. By Charles Dalton, *Editor of English Army Lists and Commission Registers, 1661-1714.*

Torpedo-Boat Raids on Harbours. By Lieut. C. G. Vereker, R.A,

Diary of Lieut. W. Swabey, R.H A. in the Peninsula. Edited by Colonel F. A. Whinyates, late R.H.A. Chapter V., Part I. and Parts II. and III.

Proposed Slide Rules for Calculating Battery Commander's Corrections. By Major A. C. Hansard, R.A.

Co-operation between Guns and Cavalry. By Major E. S. May, R.A.

With the Mountain Artilleries of France and Italy. By Major H. C. C. D. Simpson, R.A.

Terrestrial Refraction and Mirage. By Major P. A. MacMahon, R.A., F.R.S.

Royal Artillery Band.

Abstract of the Proceedings of the Fifty-Eighth Annual General Meeting of the Royal Artillery Institution.

The Training together in peace time the Garrison Artillery Forces of the Empire, including Regular, Militia, Volunteer and Colonial Artillery. (Silver Medal Prize Essay, 1895). By Captain E. G. Nicolls, R.A.

The Training together in peace time the Garrison Artillery Forces of the Empire, including Regular, Militia, Volunteer and Colonial Artillery. (Commended Essay, 1895). By Lieut.-Colonel R. F. Williams, R.A.

The Training together in peace time the Garrison Artillery Forces of the Empire, including Regular, Militia, Volunteer and Colonial Artillery. (Commended Essay, 1895). By Lieut.-Colonel A. W. White, R.A.

Centenary Cup. Communicated by the Secretary.

Instruments for looking through thick walls with small apertures. By A. H. Russell, Captain of Ordnance, U.S. Army. Communicated by the Secretary.

An account of the relief of Chitral Fort from Gilgit and the Siege of Chitral. By Lieut. C. G. Stewart, R.A.

Eastern and Western views of Mountain Artillery (a Review). By Major H. C. C. D. Simpson, R.A.

Notes on German Manœuvres, 1894 By Colonel A. E. Turner, C.B., A.-A.-G., R.A.

Siege of Gibraltar. By Brevet.-Lieut.-Colonel J. Adye, R.A.

On Magazine Regulations. Communicated by the Deputy-Assistant-Adjutant-General, R.A.

Terrestrial Refraction and Mirage. By Lieut. F. M. Brown, (I.O.M.), R.A.

The Artillery in Chitral. By Captain G. F. Herbert, R.A.

More brief considerations on Coast Defence. By Col. D. O'Callaghan, R.A.

A new method of Setting the Tyres of Wheels. By Major G. P. Owen, R.A.

The Ammunition Service of a Fort. By Major R. F. Johnson, R.A.

The Casualty Returns of the German Artillery at the Battles of Colombey, Mars-la-Tour and Gravelotte. By Major F. G. Stone, D.-A.-A.-G., R.A.

Adjusting Clinometer Planes of Ordnance. By Captain W. E. Donohue, R.A., I.O.M.

On the Employment of Artillery in Cuba. By Lieut.-Colonel J. C. Dalton, R.A.

Extracts from Old Order Books, R.A., Sheerness. Communicated by Captain W. H. Cummings, R.A.

Balaklava. (A Recollection). By F.T.W.

A few hints on marching at home and abroad. By Major J. Hotham, R.H.A.

A list of the Artillery Company in Scotland at the time of the Union, and their Pay. By Charles Dalton, *Editor of English Army Lists and Commission Registers, 1661-1714.*

Notes on the German Siege Artillery and 4-Gun Field Batteries. By Major H. C. C. D. Simpson, R.A.

Hints for the guidance of Officers, at foreign stations, in the detection of precious stones. By Major T. Preston Battersby, O.S. Department (*late* R.A.)

Indian Troop Horses in stables and on the line of march. By Major E. C. Hawkshaw, R.A.

Capillary Ripples. By Professor C. V. Boys, F.R.S.

Verifying at the Mean of the 100 Yard Bracket. By Captain A. ff. Powell, R.A.

Two Authorities on the "Eastern Question." General Sir Collingwood Dickson, V.C., G.C.B., R.A., and General W. H. Askwith, R.A.

Okehampton, 1895, and the Progress there in Recent Years. By Captain J. Headlam, R.A.

Incidents of Bush Warfare. By Major W. D. Conner, R.E., Professor of Fortification at the R.M. Academy, Woolwich.

Adjustable Pointers for Concentrating the Fire of Guns in Groups. By Major Latham C. M. Blacker, R.A.

Major-General William Phillips.

Marlborough and his Methods of Warfare. By T. M. Maguire, Esq., LL.D.

APPENDIX H.

Precis and Translations Published during the Year.

FRENCH	"Revue d'Artillerie." Offensive and defensive arms at the battle of the Yalu. By M. P. Merveilleux du Vignaux. Translated by F. E. B. L.
	"Revue Militaire de l'Etranger." February, 1894. Artillery of large Calibre with Field Armies. *Précis* by Lieut.-Colonel J. H. G. Browne, *late* R.A.
	"Revue Militaire de L'Etranger. July, 1894. Foot Artillery with Horsed-Carriages in Germany. *Précis* by Lieut.-Colonel J. H. G. Browne, *late* R.A.
	"The Field Gun of the Future." As proposed by General Wille and his critics. Translated by Captain H. A. Bethell, R.A.
GERMAN	The Operations of Wellington and Soult in 1809 and 1812. By the late Major Von Roessler of the German General Staff. Communicated by Major E. S. May, R.A.
ITALIAN	"Revista di Artigliera e Genio." Ottobre e Novembre, 1894. Fortress Warfare. Translated by Major R. M. B. F. Kelly, R.A.

APPENDIX I.

LIST

OF

FOREIGN MAGAZINES AND JOURNALS

TAKEN IN BY THE

R. A. INSTITUTION;

WITH THE NAMES OF OFFICERS WHO HAVE UNDERTAKEN TO SUPPLY PRÉCIS AND REVIEWS OF THEIR CONTENTS FROM TIME TO TIME.

COUNTRY.	NAME OF JOURNAL, &c.	TRANSLATOR.
France	Spectateur Militaire.....	
	Journal des Sciences Militaires.	Major J. F. Manifold.
	Revue d'Artillerie.....	Lt.-Col. F. E. B. Loraine, late R.A.
	Revue Militaire de l'Etranger.	Lt.-Col. J. H. G. Browne, late R.A., and Capt. E. J. Granet.
Spain	Memorial de Artilleria.....	Lt.-Col. J. C. Dalton.
Germany	Neue Militärische Blätter	—
	Archiv für die Artillerie-und-Ingenieur-Officiere	Major R. M. B. F. Kelly.
	Militär-Wochenblatt	Major E. S. May.
Austria	Organ der Militär-Wissenschaftlichen Vereine	—
	Militärische Zeitschrift.....	—
	Mittheilungen, &c., des Artillerie- und Genie-Wesens	Major L. C. M. Blacker.
Italy ...	Giornali di Artigleria e Genia...	Capt. H. de T. Phillips.
	Rivista " " "	Major R. M. B. F. Kelly. Major A. Samut, O.S.D. R. Malta Artillery.
Russia ...	Journal of Artillery.....	Major E. A. Lambart. Major G. T. Kelaart.
	Russki Invalid	Lieut. E. G. Cheke.
	Oruzhennii Sbornik	Capt. E. A. Campbell.
Sweden ...	Artilleri-Tidskrift	—

ALTERATIONS IN THE CLOTHING OF THE ROYAL ARTILLERY IN INDIA.

BY

COLONEL A. B. STOPFORD,

ASSISTANT-ADJUTANT-GENERAL ROYAL ARTILLERY IN INDIA.

THE recent introduction of changes in the dress of the Royal Artillery in India will, I think, be found to be of considerable interest to all ranks of the Regiment.

It will be remembered that Army Order, No. 13 of 1st January, 1894, introduced at home the new system of clothing accounts, and divided the soldier's clothing into two classes, "personal" and "public." This division, as made applicable to India, is given below. (I have omitted all not belonging to R.H.A. or R.A.)

PERSONAL.	PUBLIC.
Tunics,	Haversacks,
Frocks, Serge,	Jack Spurs,
Jackets, (dress and undress),	Cloaks,
Trousers,	Great Coats,
Knickerbockers,	Capes.
Pantaloons,	
Gaiters,	
Forage and Field Caps,	
Helmets,	
Boots,	
Gloves,	
Khaki and White Clothing.	

The same order also directed that issues of personal clothing should be renewed on the anniversary of the soldier's enlistment. To adopt this order in India would, however, prove very inconvenient. The existing practice of renewing issues on 1st April has worked well and is to be continued.

Advantage was taken of the reconstruction of the orders on the subject of clothing to embody in those orders such changes in the clothing itself as would adapt it more to the requirements of India.

Recommendations were made by certain senior officers that all full dress should be abolished in India, and that white clothing might be entirely replaced by khaki.

Several other suggestions, such, for instance, as the introduction of khaki serge as a material of clothing, were put forward; but on these the Commander-in-Chief in India decided to pass no order pending the receipt of full reasons for and against them. On two points however, His Excellency gave rulings at once.

(1). That the Horse Artillery dress jacket is not to be abolished.

(2). That white clothing is to be retained.

In view of ascertaining the opinions generally of artillery officers in India on the subject of the most suitable scale of clothing for the soldier, tables of proposed issues were drawn up for each of the six following branches of the Regiment :—

Royal Horse Artillery.

Mounted men of Field and Heavy Batteries.

Dismounted men of Field Batteries.

Mounted men of Mountain Batteries.

Dismounted men ditto ditto.

Garrison Artillery and dismounted men of Heavy Batteries,

and these tables were circulated to commanding officers for report.

As the average duration of residence in India of a short service man is about six years, the issues were calculated on a supposed stay in India of that length.

The result of the reference of those proposals to commanding officers was that they were generally accepted, though of course some exceptions were taken, and some officers seized the opportunity to make suggestions in addition to those which had been submitted to them. Some of these suggestions were as follows :—

The introduction of a khaki serge field service cap.

Some were in favour of blue putties and some of khaki ones.

The introduction of a warmer material for khaki pantaloons for issue to batteries serving in cold climates such as the Panjab and the N.W. Frontier.

The issue of a cardigan waistcoat.

Only one officer advocated the retention of the tunic.

Several advocated the introduction of khaki serge, while others represented that it is unsuitable for issue to troops owing to its susceptibility to dirt and stains.

The result of these references is that the following recommendations were made to Government by the Commander-in-Chief in India, and have been accepted in toto. The new issues come in force from 1st April, 1896.

Royal Horse Artillery.

Articles.	Old Issue.	New Issue.	Remarks.
Dress jacket	Quadrennial	1 in 5 years	
Undress ,,	Triennial	Abolish	
New undress frock		Biennial	
Serge patrol jacket	Biennial	Abolish	
Cloth pantaloons	Biennial	Abolish	
Tartan ,,		Triennial	
Khaki cord pantaloons	Annual	1 arrival issue 1 annual	Will be worn as a rule on all mounted drill parades.
Cloth trousers	Biennial	Abolish	
Tartan ,,		Biennial	
Knee boots	Biennial	Triennial	Will be seldom used on parade, their place being taken by gaiters and brown ankle boots.
Wellington boots	Biennial	Triennial	
Ankle boots (brown) M.B. pattern, with spur rests.		Annual	Will generally be worn on mounted drill parades, with gaiters.
Gloves	Annual	Triennial	
Field Service cap	Triennial	Annual	Round caps will not be kept up. One is issued to the soldier on arrival in England *vide* Home Clothing Regulations.
Khaki coats	2 on joining ‡ 1 Annual	2 arrival issue ** 1 annual **	‡ One for the year of joining, the other an advance issue for the following year.
,, trousers	1 on joining § 1 Annual	1 arrival issue † 1 biennial †	** Three khaki coats on joining. § An advance issue for the following year. † Two pairs on joining.
White suits	3 on joining ‖	As now	‖ One set of buttons with rings, and one pair of shoulder cords are issued for three coats.
Brown leather gaiters		Biennial	

Mounted Men of Field and Heavy Batteries.

Articles.	Old Issue.	New Issue.	Remarks.
Tunic	Quadrennial	Abolish	Two frocks will be issued on joining—one for full dress with a red collar, and braided in front like the present tunic. The other with blue collar and no yellow braid for guards, &c. The dress frock when unfit for its purpose, can be converted into an undress one.
Serge frock	Annual	Abolish	
New pattern dress frock		Biennial	
,, undress ,,		1 arrival issue	
Cloth pantaloons	Biennial	Abolish	
Tartan pantaloons		Triennial	
Khaki cord pantaloons	Annual	1 arrival issue 1 annual	Will be worn as a rule on all mounted drill parades.
Cloth trousers	Biennial	Abolish	
Tartan ,,		Biennial	

Mounted Men of Field and Heavy Batteries.—*Continued.*

Articles.	Old Issue.	New Issue.	Remarks.
Knee boots	Biennial	Triennial	Will be seldom used on parades, their place being taken by gaiters and brown ankle boots.
Wellington boots	Biennial	Triennial	
Ankle boots (brown) M. B. pattern with spur rests.	...	Annual	Will generally be worn on mounted drill parades with gaiters.
Gloves	Annual	Triennial	
Field service cap	Triennial	Annual	Round cap will not be kept up. One is issued to the soldier on arrival in England, *vide* Home Clothing Regulations.
Khaki coats	2 on joining † / 1 annual	2 arrival issue †† / 1 annual ††	† One for the year of joining, the other an *advance issue* for the following year.
Khaki trousers	1 on joining ‡ / 1 annual	1 arrival issue ‡‡ / 1 biennial ‡‡	†† Three khaki coats on joining. ‡ An *advance issue* for the following year. ‡‡ Two on joining.
White suits	3 arrival §	As now	§ One set of buttons with rings, and one pair shoulders cords are issued for three coats.
Brown leather gaiters	...	Biennial	

Dismounted Men of Field Batteries.

Articles.	Old Issue.	New Issue.	Remarks.
Tunic	Quadrennial	Abolish	Two frocks will be issued on joining—one for full dress with a red collar, and braided in front like the present tunic. The other with blue collar and no yellow braid for guards, &c. The dress frock, when unfit for its purpose, can be converted into an undress one.
Serge frock	Annual	Abolish	
New pattern dress frock	...	Biennial	
,, ,, undress frock	...	1 arrival issue	
Khaki cord pantaloons	Biennial	1 arrival issue / 1 Biennial	
Cloth trousers	Annual	Abolish	
Tartan trousers	...	Annual	
Wellington boots	Biennial	Triennial	
Ankle boots	Annual and biennial	Abolish	
Ankle boots (brown) M.B. pattern.	...	Annual and Triennial	
Gloves	...	Triennial	
Field service cap	Triennial	Annual	Round cap will not be kept up. One is issued to the soldier on arrival in England, *vide* Home Clothing Regulations.
Khaki coats	2 on joining † / 1 Annual	2 arrival issue †† / 1 Annual ‡‡	† One for the year of joining, the other an advance issue for the following year.
Khaki trousers	2 on joining † / 1 Annual	2 arrival issue ‡‡ / 1 Annual ‡‡	†† Three khaki coats on joining. ‡‡ Three on joining.
White suits	3 on joining ‡	As now	‡ One set of buttons with rings and one pair of shoulder cords are issued for three coats.
Brown leather gaiters	...	Biennial	

Mounted Men of Mountain Batteries.

Articles.	Old Issue.	New Issue.	Remarks.
Tunic	Quadrennial	Abolish	
New pattern dress frock		Biennial	
,, ,, undress frock		Biennial	
Blue serge Norfolk coat	Annual	Abolish	
Cloth trousers	Quadrennial	Abolish	
Tartan trousers		Biennial	
Blue serge knickerbockers	Annual	Abolish	
Tartan pantaloons		Triennial	Pantaloons of tartan and khaki cord are preferable to knickerbockers for mounted men.
Khaki cord pantaloons		1 arrival issue 1 annual	
Khaki coats	3 on joining † 1 Annual	2 arrival issue †† 1 annual ††	† Two for the year of joining, the third an *advance* issue for the following year †† Three khaki coats on joining.
Khaki trousers	3 on joining † 1 Annual	1 arrival issue § 1 biennial §	§ Two on joining.
Ankle boots, brown	2 annual 1 triennial	1 arrival issue 2 annual	
Field service cap	Triennial	Annual	
Brown leather gaiters	Annual	Biennial	
Blue putties		Biennial	
Gloves	Annual	Those brought out from home to be kept up by soldier.	

Dismounted Men of Mountain Batteries.

Articles.	Old Issue.	New Issue.	Remarks.
Tunic	Quadrennial	Abolish	
New pattern dress frock		Biennial	
,, ,, undress frock		Biennial	
Blue serge, Norfolk coat	Annual	Abolish	
Cloth trousers	Quadrennial	Abolish	
Tartan trousers		Triennial	
Blue serge knickerbockers	Annual	Annual	
Khaki drill suits	3 on joining † 1 annual	2 arrival issue †† 1 annual ††	† Two suits for the year of joining, the third an *advance* issue for the following year. †† Three khaki suits on joining.
Ankle boots, brown	2 annual 1 triennial	1 arrival issue 2 annual	
Field service cap	Triennial	Annual	
Brown leather gaiters	Annual	Biennial	
Blue putties		Biennial	

Garrison Artillery and Dismounted Men of Heavy Batteries.

Articles.	Old Issue.	New Issue.	Remarks.
Tunic	Quadrennial	Abolish	
Serge frock	Annual	Abolish	Two frocks will be issued on joining—one for full dress with a red collar, and braided in front like the present tunic. The other with blue collar and no yellow braid, for guards, &c. The dress frock when unfit for its purpose can be converted into an undress one.
New pattern dress frock ...	...	Biennial	
,, ,, undress frock ...	...	Triennial	
Cloth trousers	annual & quadrennial	Abolish	
Tartan trousers	...	1 arrival issue ... 1 annual	
Ankle boots	2 pairs annually ...	2 pairs annually ...	
Round forage cap	Triennial	Abolish	Round cap will not be kept up. One is issued to the soldier on arrival in England, *vide* Home Clothing Regulations.
Field service cap	Biennial	Annual	
Khaki coats	2 on joining † ... 1 annual	2 arrival issue †† ... 1 annual ††	† One for the year of joining, the other an advance issue for the following year. †† Three khaki coats on joining.
Khaki trousers	2 on joining † ... 1 annual	2 arrival issue ‡‡ ... 1 annual ‡‡	‡‡ Three pairs on joining.
White suits	3 on joining ‡ ...	As now ...	‡ One set of buttons with rings, and one pair of shoulder cords are issued for these coats.
Blue putties	...	Biennial	

Before analysing these scales I must explain the meaning of the word "tartan," which occurs so frequently therein. It has nothing to do with colour or design. It is simply the trade name for a material which is stouter than serge and lighter than cloth.

Proceeding then to a study of the new issues of clothing, it will be seen that the following are the main changes introduced.

In *all branches* tartan is substituted for cloth as the material for trousers; the round forage cap is abolished, a field cap being given in its place every year. White and khaki issues remain unchanged.

In *all mounted branches* the biennial cloth pantaloons are replaced by triennial tartan ones. The period of wear is extended, not because the new material is expected to last longer, but because it is hoped that the use of khaki cord pantaloons will become much more frequent and that the blue ones will be but rarely worn.

In *the Horse Artillery* the dress jacket has been retained, but the undress jacket is abolished. The biennial serge patrol jacket is replaced by a somewhat similar garment of tartan.

For all except Horse Artillery there has been a great innovation in the total abolition of the tunic and of the introduction of a tartan frock. This frock is to be made loose, in fact is to be cut so "full" that a soldier can perform any duty without unbuttoning it; and it will have outside breast pockets. For dress, *i.e.*, when it is to take the place of the tunic, it is trimmed with braid, cord, collar, etc., exactly like the present pattern tunic, with the exception of the skirts which are quite plain. To convert this frock into an undress garment, to take the

place of the present serge frock, all that is necessary is to substitute a blue collar, of the same material as the frock, for the red one, and to remove all cord and braid.

Another great innovation for *all mounted men* is the abolition of putties and the introduction of a brown ankle boot and brown leather gaiter. These are to be worn only with the khaki cord pantaloons, the annual issue of which is continued, and which are intended to be worn as *the* ordinary dress; the use of the blue pantaloons, the material of which has been changed from cloth to tartan—a lighter substance—and the issue of which has been changed from biennial to triennial, being confined to special and ceremonial occasions. For these men also the annual issue of gloves has been changed to a triennial one, and the length of wear of Wellington and knee boots has been prolonged from two to three years.

As the new tartan frock, being cut so loose, will meet the requirements of the *Mountain Artillery*, it has been decided to abolish the blue serge Norfolk coat of this branch and to substitute the new frock. The blue serge knickerbockers of the few mounted men of this branch have been replaced by tartan and khaki cord pantaloons.

The only special change which affects the *Garrison Artillery*, including dismounted men of Heavy Batteries, in addition to the alterations mentioned above as common to all branches, is the triennial issue of a pair of putties.

Dealing now seriatim with the several articles of clothing.

Frocks and Jackets.

Each man, except in the Horse Artillery, will be given a new pattern dress tartan frock biennially in advance, and an undress frock on arrival. He will thus have two coats to commence with.

At the end of two years he gets a new dress frock and an allowance for converting his old dress frock into an undress one. The same at the end of the fourth year and so on; but in the event of his going home in his sixth year no allowance for conversion of the dress into an undress frock is given, as in all probability the man will draw compensation for the garment.

The undress frock of the Horse Artillery will be easily distinguished from that of other branches by the fact that it has no breast pockets and has yellow shoulder cords in place of shoulder straps.

The shoulder straps of all except Horse Artillery will carry the number or initials of the battery or company as in England.

In connection with this subject, I may mention that as medals are only allowed to be worn on "tunics," application has had to be made to the War Office for special sanction to wear them with the dress frocks which are to take their place.

Experiments are being made with black cloth tabs in place of leather ones. Although apparently preferable in every way the former will not be finally approved unless after a thorough trial the dye is found not to run in the hottest and moistest climates.

Pantaloons.

The new tartan pantaloons will be strapped with black moleskin. Care must be taken not to clean this moleskin with soda or ammonia. Grease spots or stains may be removed with benzine or turpentine.

Although the one word "tartan" refers to the material to be used for frocks as well as that for pantaloons and trousers, the pattern chosen for the latter, *i.e.*, pantaloons and trousers—is of stouter texture than what is to be worn for the frocks.

Arrangements have been made for the khaki cord pantaloons to be cut in future longer in the back and fuller over the thigh; and it is hoped that the days of tight pantaloons and straining seams are at an end.

Trousers.

The issue of trousers, including "overalls," have undergone no practical change, beyond the substitution of tartan for cloth. It appears to be unknown to many artillery officers that the word "overalls" is not recognized in any War Office publication and should not, therefore, be used in official correspondence.

Boots.

It will be seen that the only branch which retains its *black* ankle boots is the Garrison Artillery. All others get *brown* ankle boots of the Mountain Battery pattern, which pattern has had many years trial and proved to be a success. Mounted men have a spur rest, *i.e.*, a small leather knob at the back about an inch above the heel to support the jack spur. Dismounted men have none.

Prior to the introduction of this new scale a mounted artilleryman in India *had to provide himself* with ankle boots for wear in field service marching order, at practice camps, etc. He will now get a free annual issue of ankle boots.

Knee boots will accordingly be less frequently worn and Wellington boots will only be required for "walking out," so the issues of these to Horse and Field batteries have been changed from biennial to triennial.

Spur Straps.

Although the tables of proposed issues which were circulated for the opinions of commanding officers distinctly contemplated the substitution of brown for black ankle boots, and although suggestions were freely invited, it is curious that in not one single case was it pointed out that, as the black strap could not be worn over the brown boot, the change would necessitate the provision of a brown spur strap.

And it is extraordinary what trouble this change entailed. The soldier is given only one pair of spurs and his black spur straps are sewn on to it. The issue of a second pair of spurs to be worn with the brown boots was out of the question. It has been decided to leave the black understrap and black short buckling piece sewn on to the spur; and to make the black upper strap removable by opening the stitching and substituting a stud and holes as a means of attaching to the spur. A similar brown upper strap is provided to be worn with

brown boots, this being similarly attached to the spur by a stud fastening into holes cut in the strap. So all that is necessary in changing from brown to black spur straps is to change the upper strap. One small alteration to the short black buckling piece was found necessary to avoid the eyesore of a brown strap passing through a black keeper. This has been overcome by the removal of the single buckle and keeper, and the substitution of a double buckle.

Gloves.

Hitherto an annual issue of gloves has been allowed. This was acknowledged by all to be quite unnecessary and many recommended their total abolition. As, however, gloves are worn occasionally, the issue has been changed from an annual to a triennial one.

Caps.

The field cap, which is to take the place of the round forage cap, is identically the same as the field cap in wear at home.

Gaiters.

The introduction of these gaiters is, perhaps, the most revolutionary innovation of modern days ! ! Hitherto their wear has been confined to the Mountain Artillery men, both mounted and dismounted, and has proved an unqualified success. Men of Horse and Field Artillery have hitherto worn the putties with ankle boots, which putties, I may mention, they had to provide at their own expense. I do not assert that the opinion in favour of the adoption of these gaiters was unanimous, but it was very marked.

I think many of those who recommended the adoption of the gaiter had in their mind the straight gaiter worn so much now by all in plain clothes. But they can hardly have experimented with it on the rank and file. Had they done so they would have found that a certain amount of shaping to the calf and ankle is indispensable to prevent its rucking up or twisting. To make any such gaiter perfectly serviceable a footstrap is necessary. But our tastes are not yet educated down to such an eyesore and the footstrap must be dispensed with.

The gaiter is made of plain brown leather. It is fastened down the front by one long leather lace forming loops which pass through five eyelet-holes, and is secured at the top by a leather strap passing through the top loop and buckling (point of strap to the rear) into a brass buckle ½ inch square. It must be borne in mind that part of the principle of this method of fastening is that the several loops which pass through the eyelets must not be separately attached to the gaiter, but must be formed of one long lace. The reason is that should any part of the fastening be caught or strained it will not break, as the shock will be distributed along the whole length of the lace.

There is a small shaped nick about an inch deep at the back to take the spur. Inside each gaiter are two leather loops, one in front and one in rear, as in ordinary riding gaiters. These loops are to fasten to two buttons which will be sewn to the pantaloons to prevent the gaiter from twisting round.

The gaiter fits tight below the knee and is shaped to the leg below the calf, fitting closely round the boot at the ankle. The lower corners are slightly rounded.

Putties.

Although putties have been freely worn in India, they have never been given to the soldier as part of his clothing. As I mentioned before, he has always had to provide them for himself. This will now be altered. Those who are required to wear putties, viz., Mountain and Garrison Artillery, will receive a biennial issue of them in advance.

The regulation puttie is dark blue, 8 ft. long, 4 inches wide and without seam at the edges.

General.

In the above remarks I have only referred to the clothing of the rank and file. That of the warrant and senior non-commissioned officers is practically identical with it, with such slight exceptions as the issue of rather finer material and more elaborate trimming of gold lace.

The great saving clause of all these scales is par. 10 of Army Order 13, of 1894, which grants full compensation credited in advance for any article of personal clothing, provided the time-expired article has three months' further wear in it and which recognizes the application of such compensation to the purchase of other clothing or necessaries that the soldier may require.

Without such latitude as is given by the above order, which of course is applicable in its fullest sense to India also, it would have been hopeless to attempt to frame scales of clothing suitable to all the climates of Asia, varying from the bitter cold of Darjeeling to the moist heat of Rangoon or Aden.

Much liberty of action is thus given to commanding officers, who, it is hoped, will make free use of it.

Only one point more, and that as affecting officers. Officers' uniform will remain unchanged with the exception that they will have to provide themselves with brown ankle boots and brown leather gaiters. The boots must be ordinary lace boots without toe-caps and the gaiters will differ from those worn by the men in being cut straight down from the calf in place of being shaped at the ankle. As regards the method of fastening, etc., they will be the same as those to be worn by the men.

THE CHINO-JAPANESE WAR.

BY

CAPTAIN N. W. H. DU BOULAY, R.A.

(A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 26th March, 1896).

MAJOR-GENERAL J. F. MAURICE, C.B., IN THE CHAIR.

CAPTAIN DU BOULAY—I very much appreciate the honour of being invited to give a lecture in this theatre and I still more appreciate the honour of having such a large audience. In September 1894 I received a telegram asking whether I would accept special service with the Japanese army in the field, and I need scarcely say that I had no hesitation in accepting. I was most fortunate in having, as a companion, Surgeon-Colonel Taylor, who is probably well known to many here; and those who know him will appreciate my good luck. Captain Cavendish of the Argyll and Sutherland Highlanders also went out with us, as far as Yokohama, going on from there to Peking to watch the war, on the Chinese side, and I am pleased to see him here to-night. The war had been going on about two months when we received our orders and it was therefore necessary to leave England as soon as possible in order not to be too late.

In June 1894, in consequence of the unsettled state of Korea, the Japanese sent a brigade of all arms, belonging to the 5th division, to Seoul, which is the capital of Korea, and as the negotiations with China were unsatisfactory, and Chinese troops were being collected in Korea, further decisive action was determined upon towards the end of July.

The first step was to get possession of the King of Korea and his palace, and this was done without difficulty on the 23rd July. The Korean Guards fired a few rounds and the Japanese had one man killed and one wounded, and I believe this was the first blood shed. On the same day a squadron of three cruisers, the *Yoshino*, *Akitsushima* and *Naniwa* left Sasebo in Japan and went from there to Chemulpo, which is the port of Seoul. At this time the Chinese had about 3500 men at Asan, 4000 at Ping Yang and 4000 more marching towards Ping Yang from the north. War had not been declared; but, if war was to come, it was plainly advisable for the Japanese to precipitate matters and act before the Chinese forces could join hands. Ac-

cordingly on the 25th July the Japanese troops were set in motion against the Chinese at Asan. The Japanese force was about 6000 men all together. On the 25th July they started, and it was on this day that the first naval fight took place, which really began the war. The cruisers I have mentioned, as they steamed towards Chemulpo, came across some Chinese men-of-war off Asan and a short naval fight ensued. The Chinese ships soon retired and were pursued; leaving, however, the steamer *Kowshing* in the presence of the Japanese cruiser *Naniwa*. The *Kowshing* was an English steamer carrying Chinese troops to Asan, and, as you know, she was sunk and most of the troops on board were drowned; and the question was raised as to whether the Japanese were within their rights in firing on a British ship. On the 28th July the Japanese force from Seoul found itself in the presence of the Chinese who had moved forward from Asan and were in position on a ridge at a place called Seikan (I am using the Japanese pronunciation of the names of these places, except of some well known places such as Ping Yang, because I do not know the Chinese or Korean pronunciation and I have heard the Japanese).

The Japanese moved off to attack the Chinese at midnight; and the latter were soon turned out of their position and retreated towards Asan. They were pursued by a Japanese infantry battalion, but a halt was made by the pursuers for rest and refreshment, and the Chinese got clean away to Shinshu, the Japanese losing touch of them altogether. They found lots of provisions at Asan, and after remaining there about a day they begun their return journey to Seoul, which they reached on the 5th August. Preparations were then begun for the more serious business of driving the Chinese out of Korea.

Before continuing this account I think it would be as well to state briefly how the Japanese army is organized. Organization is a matter to be read in a book rather than listened to at a lecture, but the Japanese army organization is so simple that I think a few words will explain it sufficiently. It owes its origin to the French, as the Japanese naval organization owes its origin to the English; though in both cases modifications have been introduced by the Japanese themselves to suit their own requirements and to keep their services abreast of the times, and as regards the army, a great deal has been copied from the Germans. They have compulsory service, and it consists of three years with the colours, four years in the 1st reserve, and five years in the 2nd reserve, making twelve years in all. The recruits are drawn by lot and are taken in December of the year in which they reach the age of 20. There is also the so-called national army which is not yet organized completely—consisting of all men medically fit between the ages of 17 and 40, and including those who have already done their 12 years' service.

The names of the several units are the same throughout the service, thus an infantry battalion, cavalry regiment, artillery brigade division have all the same word in Japanese—"Daitai"; and in the same way a company, battery or squadron are all called by another Japanese name—"Chutai."

The army is organized in seven separate divisions; the Guards division, which is recruited throughout Japan, and six others which are numbered from one to six and which are territorial in the fullest sense of the term. These six territorial divisions are all alike, except that some of them include coast defence troops. The Guards division is rather smaller than the others, but it is organized practically in the same way; so that when once you have the organization of one division you have the organization of the whole Japanese army. Each division is intended to be a complete unit in itself and consists of two infantry brigades, one regiment of artillery, one battalion of cavalry (I call it battalion because that is the word used throughout), one battalion of engineers, one train battalion, one medical corps; and besides these, the intendant staff, the accountant staff, the veterinary staff and the law staff.

In war time the infantry is composed thus :—Four companies make a battalion; three battalions make a regiment; two regiments make a brigade; and two brigades make a division; so that there are six battalions in a brigade and twelve battalions in a division. A company numbers about 220 officers and men and is divided into three sections. In the artillery, two batteries, of six guns each, make a brigade division or battalion, and three battalions make a regiment, of which two are Field Artillery battalions and one is a Mountain Artillery battalion; so that there are six batteries or 36 guns in a regiment, and therefore in a division. With regard to cavalry, two squadrons of about 160 non-commissioned officers and men each, form a battalion and that is all there is in a division, but since the war they have been raising a 3rd squadron. With regard to the engineers, three companies of the same strength as in the infantry form the battalion, and on mobilisation two of these companies are used as field companies while the 3rd company forms the bridging and telegraph sections when they are required. There are two bridge sections in each division, one for a bridge 96 metres long and the other for a bridge of 36 metres. The telegraph section has material for 30 kilometres of telegraph.

The train battalion ceases to exist as such on mobilisation, but provides the transport for the whole division—*i.e.*, regimental transport, divisional supply columns and divisional ammunition columns, though a large number of artillery and infantry reservists are used for the ammunition columns.

The medical corps on mobilisation forms a bearer division and six field hospitals. I call it a bearer division because I do not know what other name to give it. A bearer division consists of a central staff and two bearer companies. The bearer companies are composed chiefly of infantry soldiers; they do not treat the wounded, but carry them to the central staff for treatment. The central staff is composed of medical officers and medical attendants, and they form the dressing stations as required.

The intendant staff does the work of our Pay Department and Army Service Corps combined, but without the transport work of the latter.

The accountant staff does the clerical work under the intendant staff.

The law staff does the work of our courts martial; after the manner, I believe, of the French system.

The 1st reserve is used to raise the units from peace to war strength and to assist in the formation of depôts.

The 2nd reserve is mobilised territorially and is used for garrison work and on the lines of communication.

The Guards division, which is recruited throughout the Empire, has no 2nd reserve. The men who go to the 2nd reserve from the Guards join one of the six territorial divisions.

We had an opportunity very soon after our arrival in Tokio of seeing a march past of the Guards division. It was on the Emperor's birthday; and though robbed of much of its splendour, owing to the absence of His Majesty at Hiroshima and the fact that all ranks were wearing undress uniform ready for active service, it was still a very fine sight to see a march past of 12 infantry battalions, each over 800 strong. They were a very fine, sturdy looking lot of men and marched admirably. They were of course short as compared with our standards, but were a remarkably level lot.

There were two points which struck one at once as curious at this review; one was that the Imperial Prince in command, Prince Komatsu, was the only mounted officer at the saluting point. There were lots of officers there looking on, in full dress uniform, but all on foot. And the other point was that there was only one band. But this band showed true Japanese powers of endurance and went on unceasingly, playing the same few bars over and over again, whilst the whole division went by. Bands have only recently been started. There is a school for military music, and the Guards and 4th divisions have each a band, but no other division as yet. We were fortunate in finding a band with the headquarters of the 2nd army (which was the army which we joined) which had been formed from the School of Music; and its members entertained us, not only with excellent music, but with some really first class acting during our stay at Kinchou.

Now to return to the war. The remainder of the 5th division left Japan on the 8th August, landed at Fusan and marched from there to Seoul under General Nodzu, the division commander; and a mixed brigade of the 3rd division was sent to Gensan, but did not arrive until the end of August. General Nodzu's command, which included for the present the troops sent to Gensan, was divided into the following detachments:—(i.) General Oshima's brigade, which was the brigade originally sent to Korea. This was at the junction of the roads near Heizan, and consisted of five battalions of infantry, one squadron of cavalry, two mountain batteries, one engineer company and a medical detachment. (ii.) The Sakunei detachment consisting of six companies of infantry, one mountain battery, and a troop of cavalry, under General Tachimi. (iii.) The Gensan detachment, consisting of one infantry regiment, one troop of cavalry, and two mountain batteries, under the command of Colonel Sato. (iv.) The main column, which

was at Seoul and just north of it, and consisted of the rest of the 5th division.

General Nodzu's first plan was to send Oshima's brigade against Ping Yang by the direct road, and the whole of the rest of his troops round by the east of Ping Yang to attack from the north and north-east, his object being to drive the Chinese westward into the sea. This plan, however, was changed and eventually the main column crossed the Ping Yang river at a place called Juniho and marched up the right bank. So that we have Oshima's brigade approaching Ping Yang from the south, the Sakunei and Gensan detachments from the north-east and north and the main part of the 5th division from the south-west. It was arranged that a combined attack should be made from all sides on the 15th September and it was left to the several commanders to bring their detachments within striking distance by that day. Apparently there was hardly any intercommunication between the columns, and until the afternoon of the 14th, the day before the attack was to take place, both General Oshima and General Nodzu were ignorant of the whereabouts of the Gensan and Sakunei detachments.

On that day General Nodzu ordered General Oshima to engage the attention of the Chinese on the 15th, but to postpone the real attack till the 16th as the main column was a day behind time; General Oshima acknowledged the receipt of the order, but pointed out that in all probability the Gensan and Sakunei detachments would attack on the day appointed, and, if this were the case, he himself would feel bound to give them all the assistance he could; especially as the main column would be unable to help.

On the 15th General Oshima opened fire with his guns at daylight and sent his infantry forward against some works constructed by the Chinese on the left bank of the river as a sort of bridge-head. The first work was carried by General Oshima's troops at once, but the other works proved too formidable; and now the want of communication between the several columns was felt. Colonel Sato and General Tachimi, who commanded the troops in the north, hearing the firing from the south and not having received the order to postpone the attack, went forward from their side and began fighting, and General Oshima in his turn, hearing their guns, instead of contenting himself with a demonstration, made his attack a real one; but he failed to make any further impression on the Chinese and suffered considerable loss, retiring in the afternoon to his former position.

The two northern detachments captured a line of works north of Ping Yang as well as Botandai, which is a walled out-work of the town standing on a separate hill. It is connected with Ping Yang by a narrow saddle along which runs a formidable wall—and in this wall stands the Gembu Gate. Two Japanese companies advanced to this gate from the north-west and found it shut; so a few men most pluckily scaled the wall under a hot fire from the north part of Ping Yang and managed to open the gate from inside. It was the capture of this gate which caused the fall of Botandai, as the defenders

became alarmed for their line of retreat and retired precipitately. But though their advance had been so far successful, the Japanese now found themselves confronted by a deep and wide ditch and the substantial walls of Ping Yang itself; difficulties which there appeared to be no possibility of surmounting; so orders were issued for the withdrawal of the troops to a respectful distance pending the advent of more favourable circumstances.

In the west the advance-guard only of the main column had come up and could effect nothing of importance against the Chinese fortifications. Its only successes had been the annihilation of two bodies of Chinese cavalry which came out of Ping Yang and tried to push through the Japanese troops and escape to the west. They came out along the road between the lines of the Japanese infantry who were posted on the slopes of the hills and were shot down almost to a man, and the scene of carnage was described as horrible.

By the middle of the day therefore the Japanese attacks may be said to have temporarily failed—and things looked anything but promising. At 4 p.m., however, in the middle of a very heavy downpour of rain, white flags were exhibited on the walls at the north end of the town. The negotiations which followed strike one as being very unbusiness-like. A Korean was sent out with a small piece of paper on which something was written; but the paper had been allowed to get wet in the rain and it was very difficult to read it. It was made out, however, to mean this: "In accordance with International Law, we have raised the white flag, as we wish to stop fighting." A Japanese officer and some men at once went to the north gate, but found it closed and the walls manned. They pushed the gate open a few inches, to the limits of its chain, and a Chinese officer then appeared who handed out a piece of paper on which was written: "As night is approaching, and it is raining heavily, please come again to-morrow." The Japanese officer replied in writing that, as the white flag had been raised, the Chinese must now submit to the orders of the Japanese general. The Chinaman then wrote: "Wait whilst I get the key of the gate," and went away. The Japanese waited, but the Chinaman never came back; so they eventually returned to their head-quarters in Botandai.

General Tachimi made the best of the business and gave out that the Chinese had surrendered and that he had agreed to postpone the occupation of Ping Yang till the following morning.

During the night the Chinese decamped *en masse* to the north and north-west. Many of them blundered against the Japanese out-posts in the darkness and were shot down—and the next morning the Japanese marched into the abandoned town, sending a small force in pursuit as far as the Seisenko river. They found a quantity of rice and stores in Ping Yang and set to work preparing for the next move forward; and it was during this time—on the 17th September—that the naval battle of Hai-yang-tao was fought. This is generally known as the battle of the Yalu; but it took place about half way between Hai-yang-tao island and Takushan, where some Chinese troops

were disembarked under cover of their fleet. The remainder of the 3rd division meanwhile arrived from Japan and the two divisions, 3rd and 5th, formed the 1st army under Marshal Yamagata.

The northward march from the Seisenko was begun on the 15th October; and on the 23rd the army was at Wiju, on the left bank of the Yalu.

The Chinese held Kurenjo and Antoken on the opposite bank, as well as Kozan, which is a hill in the angle between the Yalu and Aika rivers. The Aika is a tributary which joins the Yalu from the north, just opposite Kurenjo.

Marshal Yamagata determined to attack Kozan first and then to cross the Aika and turn the Chinese left flank at Kurenjo.

The great difficulty was the construction of a bridge over the Yalu in the face of the Chinese.

However, all the material was collected in good time and the bridge was begun after dark on the 24th October. The orders were that it was to be completed by 4 a.m., but it proved to be a longer job than was expected, and owing to several causes, amongst them the intense cold of the water, it was not finished till 6 o'clock a.m. It was so cold that the men could not work in the water without being constantly relieved. Fortunately there was a dense fog, which only began to lift at 6 a.m., and so the operations were concealed from the Chinese.

Kozan was taken without difficulty at 8 o'clock by the 5th brigade, and this seemed to wake up the Chinese, for two separate forces then advanced towards Kozan, one from Kurenjo and the other from the north. Marshal Yamagata at once ordered the 10th brigade to cross the bridge; and this brigade, advancing by the south of Kozan, took the Chinese force from Kurenjo in flank and drove it back. The infantry who had captured Kozan and the adjoining hills meanwhile moved northward towards another hill; but as they ascended the southern slopes the Chinese force from the north was ascending its northern slopes. The Chinese force was very much the stronger of the two, and the Japanese immediately fell back a short distance; but they had their guns in position, and the Chinese did not dare to come on any further. After a time the Japanese managed to get round the left flank of the Chinese, and at the same time the 10th brigade moved up the valley and attacked their right flank, and the usual thing happened; the Chinese bolted. The Japanese crossed the Aika and bivouacked on its right bank above Kurenjo—and the next morning it was found that both Kurenjo and Antoken had been abandoned by the Chinese.

General Tachimi then went on to Howojo (or Feng-huang-cheng as it is called in Chinese), and occupied that place on the 29th October without any fighting. On the 7th November Takushan was occupied by another small force, and henceforth became an important place because it was used as a base for supplying the troops who afterwards advanced to Haicheng.

Meanwhile, on the 16th October, the 1st division began to leave Japan for the projected attack on Port Arthur, forming, with half of the 6th division, the 2nd army under Marshal Oyama. And when

Surgeon-Colonel Taylor and I reached Japan the war had arrrived at this point.

We found an American officer, Lieutenant O'Brien, waiting at Tokio to go to the front and on the 7th November we all three went down to Hiroshima together, accompanied by a Japanese officer and two interpreters.

Hiroshima was not only the base of operations, but was practically the seat of government during the war. The Emperor himself was there, and most of the Ministers of State; and when funds were wanted to carry on the war, instead of holding a Session in Tokio, Houses of Parliament were run up on the spot, and a Session was held there.

It is the present western terminus of the railway, and its isolated position assisted the Japanese in keeping their preparations and movements to a certain extent secret. About three miles off is Ujina, which was the port of embarkation. The harbour is an excellent one, and has room for about 10 steamers of 2000 to 3000 tons to be loaded at the same time. Close by is Kure, one of the naval stations where transports could be repaired and sampans and launches built as required.

For the few days we were at Hiroshima we lived in a Japanese hotel. It takes some time to become accustomed to sitting on the floor, and I personally never arrived at liking it, but what I found most disagreeable was having to take my boots off whenever I went indoors and of course to put them on again when I went out. We were in uniform most of the day, as we had to pay our respects to all the generals and heads of departments; and the difficulty of putting on Wellington boots and getting one's overalls strapped down by a Japanese girl, though amusing enough at first, especially as a dense crowd assembled round the front door to watch the operation, became rather a nuisance after several repetitions. The Japanese officers themselves have given up the custom as far as regards their barracks and offices; and they wear very easy-fitting boots which can be kicked off and pulled on without any trouble.

In the hotel at Hiroshima we were made most comfortable in all other respects, and had tables and chairs provided so that we could eat and write in the western fashion.

We left Ujina on the 13th November in a Japanese transport and went by way of the Ping Yang inlet to Talienwan where we arrived on the 18th. All the transports at that time were making the journey by way of the Ping Yang inlet in order that they might be more easily protected against the Chinese fleet.

The 2nd army had already passed Talienwan on its way to Port Arthur. It had landed on the 24th October and following days at a place called Kayenko, had captured Kinchou without much fighting on the 6th November, and on the 7th had found all the Talienwan forts abandoned.

It seemed hardly credible at first that all these forts armed with modern Krupp guns (15 centimetre and 21 centimetre) should have been given up without a shot being fired; but the fact was that the moment the Japanese moved south from Kinchou they cut off the

retreat of the garrisons; and that a Chinaman does not like. I saw no works or entrenchments of any kind on the high ground south of Kinchou, which would have been the natural place for the Chinese to make a stand. The newspapers said there were regular lines of fortifications across this isthmus, but there were none at all.

The head-quarters of the 2nd army moved on from Kinchou on the 17th November; and on the 19th when we landed we had a long march of 35 miles to join them at Dojoshi. The road was so crowded with the various supply columns of the army and with the Siege Artillery, that we had to push on, leaving our baggage behind; and even so we only arrived at Dojoshi long after dark. Here we found Marshal Oyama, the Commander-in-Chief, occupying an apartment about eight feet square and dirty beyond description. We were billeted on the village schoolmaster, who was about the only inhabitant left in the place and seemed a most respectable old man. Fortunately it was not at all cold and we did not miss our blankets.

The next day, the 20th, we went out to the front to have a look at the country. The Japanese occupied some hills about two and a half miles north of the Chinese forts; and from here we looked across the intervening low ground to the hills protecting Port Arthur. During the afternoon a sortie was made by the Chinese against the Japanese right, but it was repulsed without any loss; and there was also a slight skirmish on the extreme Japanese left.

The positions of the Japanese for the night were as follows: 1st brigade and main part of 1st division at Bekashi, 2nd brigade at Sekisishi, General Hasegawa's brigade (that is the half of the 6th division) on the hills east of the main road but with one battalion west of it. There was also another detachment further east, known as the left column, which had been marching by a separate road; and the Siege Artillery were passing to the south of Dojoshi along the main road. The Siege Artillery had very hard work to get along; they were not properly horsed and they had a great deal of trouble to get their guns to the front.

The great attack was to begin at daylight on the 21st, so we turned in early and arranged to start at 2 a.m. in order to be on the ground in time.

It was very fortunate that we made an early start as we had no map that was of any use, and we had to pick our way as best we could over an unknown country by moonlight.

As day broke the battle began, and we found ourselves on a hill looking down on the Japanese Field Artillery which was on a lower ridge in front of us.

Beyond the artillery was Isuzan hill with its line of works along the crest; and this was the first objective of the Japanese.

The infantry of the 1st division with two mountain batteries had set out at 1 a.m. and keeping well to the right beyond the hills, arrived about one and a half miles west of Isuzan as day broke.

The Siege Artillery who, as I have said, had the greatest trouble in moving to the front, managed to get a few guns mounted just north of Suishiyei and commenced firing very nearly simultaneously with the

Field Artillery. For about four minutes the Japanese artillery bombardment went on without any reply from the Chinese; and the Japanese had every opportunity of ranging on the Isuzan forts. Their shooting was most regularly carried out, from right to left of the whole line of guns, with an interval of 10 seconds between each round. Then the Chinese began; and the scene immediately before us, as the sun rose, was most effective, whilst away over the hills to the south-east the Japanese fleet could be seen slowly steaming past, and the boom of big guns told us that the coast forts were firing at the ships.

The bombardment continued for about an hour; and in order to get a nearer view, we moved up to the right of the artillery and were just in time to see the Japanese infantry advancing up the slopes to the western Isuzan fort. The Chinese did not wait to receive them, and at 8 o'clock Isuzan was taken amidst loud cheers from all parts of the field. Rifle firing was then heard to the south-west, and we rode on in that direction over a very rough stony country; but were too late to witness anything. It appears that a small Chinese force had advanced on the west side of the harbour, and had been met and repulsed by the infantry of the 1st brigade, who were in reserve during the attack on Isuzan, which was carried out by the 2nd brigade. As we were too late, we had nothing to do but return to the Field Artillery position in order to see the expected attack on the other forts by Hasegawa's brigade. The batteries had just changed position as we came up and were beginning to fire at Shojuzan, and General Hasegawa's men were already moving forward from the ridge east of Suishiyei.

The attack that followed was a sight to be remembered for a life time. As the Japanese infantry moved down the open slopes to the intervening valley, they were assailed by a perfect storm of shot and shell from the forts and entrenchments on the ridge in front. The ground was ploughed up in all directions round them, and it looked as though it would be impossible for them to live through it. On they went, however, and gained the shelter of the valley, where they halted for a short time and commenced firing, and then the ascent of the hill began. On the right six companies were directed against Niriozan fort and a half company against Shojuzan, which was the fort at which the artillery were firing. On the left three companies were sent against the fort next to Niriozan and one company against the fort next to that again. The Japanese gunners had now got the range to Shojuzan and shells began to burst over it, and at 11.10 a.m. the garrison could be seen streaming away to the rear, and then as the last man left it the magazine was blown up and a huge column of smoke rose slowly into the air amidst the cheers of the Japanese.

The artillery then turned their guns against Niriozan, but they were not fortunate in getting their range in good time.

The infantry attacking Niriozan, mounted the hill at a good pace, firing occasionally, and reached a fold in the ground 200 yards below the fort. Here they halted for a few seconds to get their breath, and then on they went again, but hardly had they started when the hill side in front of them seemed to burst open, and it was seen that a row

of land mines had been exploded. The shock staggered them for a moment, but no one seemed to be hurt, and without a pause they rushed forward into the fort. But the Chinese had just gone.

Much the same sort of thing had been happening further east where the left column had been attacking, and all the land forts were in possession of the Japanese by about half-past eleven. After this there was a general movement forward from all sides; most of the 1st division was collected in the big Chinese parade ground, but two battalions moved on to Cairn hill.

It was expected that the Chinese would make a stand in Wogonzan fort on the east side of the entrance of the harbour, a fort that stood up about 360 feet high and would have been a very difficult nut to crack. (This fort had made itself very unpleasant when Isuzan was taken by keeping up an accurate fire from some 5-inch guns which effectually prevented the Japanese from remaining in the captured forts.) About 3 o'clock therefore the Field Artillery were taken forward along the main road to the spur east of Cairn hill in order to bombard Wogonzan.

It soon became apparent, however, that there were no Chinese left in the fort, so the final infantry advance was ordered. Two battalions went through the town and another skirted the town to the east and went straight up into Wogonzan fort, where the men hauled down the Chinese flag and substituted a roughly made Japanese one. The battalions that went through the town practically gave no quarter, but shot down the Chinese indiscriminately. It was a horrible sight to witness, but how far the Japanese were justified I can hardly discuss here. Certain it is that just before entering the town they came upon the heads of four of their own comrades hanging by the lower lips from some small trees by the roadside; and it is probable that the soldiers of other nations would have been indisposed to give quarter in like circumstances.

We had to go back to Suishiyei for the night, and as we crossed the parade ground we found most of the 1st division assembled there, and Marshal Oyama with his staff and the other generals all collected in the pavilion at the north end. At that moment the band struck up the Japanese national air and the whole of the assembled troops spontaneously took off their caps and cheered again and again. It was a remarkable scene of enthusiasm.

During the afternoon news had reached Marshal Oyama that Kinchou was being attacked from the north; so troops were sent off as soon as possible to assist in its defence; but by the time they arrived all danger was over.

An intensely cold northerly gale got up during the night of the 21st and the sufferings of the Chinese fugitives, who had thrown off their thick sheep skins and wadded clothes, in order to run away more easily, must have been terrible.

On the 22nd we moved into Port Arthur. The streets presented a ghastly spectacle, and were literally running with blood.

In going round the Chinese works afterwards it became clear that no real stand had been made anywhere—for there were very few dead

bodies in the whole line of land defence. The mixture of rifles, guns and ammunition was perfectly astounding. As an example, in one small work (the one in which the magazine was blown up), which was 30 yards square inside, there were the following pieces of ordnance :— Two 8-inch mortars, one 12 c.m. Krupp siege gun, one quick-firing Chinese gun of 1-inch calibre of the Hotchkiss pattern, one 8 c.m. gun marked "Merton Danzig," one 9 c.m. Krupp field gun, and one smooth-bore bronze howitzer of about 4½-inch calibre.

We found Mauser rifles, Dreyse rifles, Remington rifles, Martini-Henry rifles, Schulhof rifles, Snider rifles, muzzle-loading muskets and the "two-men weapons," of which the Chinese think so much, which are carried by two men and have a 1-inch bore; and in 50 yards of entrenchment we came upon four different sorts of rifle ammunition. But the most extraordinary and the saddest instance of want of arrangement that I saw was a dead Chinaman lying by himself surrounded by the latest magazine rifle ammunition and at his side a tower musket.

The arrival of the British fleet on the 25th was a very great event for us, for the officers of the flagship most liberally supplied our wants in the way of food, which had never been fully satisfied since we landed, as, you will remember, we had left our baggage behind. On the 1st December we went back to Talienwan by sea and then marched to Kinchou, where Marshal Oyama established his head-quarters. Here we remained for 50 days—spending our time chiefly in trying to keep out the cold. I have here a blanket great-coat which was issued to the Japanese soldiers at that time. It is an ordinary coat made of a blanket material with a fur collar and hood and a pair of mits. These were issued to all the Japanese soldiers and were obtained by public subscription in Japan.

At Kinchou the inhabitants were all quite ready to sell what they could, eggs, fish, chickens and things of that sort, and it was rather curious to see the Japanese bargaining with them : they could not speak the language but could always make themselves understood by writing or making signs, as many of the Chinese characters and Japanese characters are the same.

All the European and American newspaper correspondents left for Japan after Port Arthur; but an American, Mr. Smith, and two Frenchmen came over to Kinchou towards the end of December. They arrived one evening and we gave them what we could for dinner and saw them round to their quarters afterwards. But the next morning the two Frenchmen arrived looking thoroughly ill and saying that Mr. Smith was still worse and unable to get up. We began to wonder whether we had poisoned them or not ; but it appeared that they had gone to sleep with a particular kind of noxious fuel burning in their rooms, which had really very nearly killed them. There had been several cases of the same thing amongst the Japanese soldiers, and stringent orders were therefore issued on the subject.

We had a very festive Christmas dinner—and sat down, a party of 10 including the Marshal, in a room nine feet six inches square. The band was very kindly sent to play to us and towards midnight we got

the Marshal to join hands with us round the table and sing "Auld Lang Syne."

Whilst we were thus waiting at Kinchou for the expected attack on Wei-hai-wei, the 1st army had been pushing forward in the north.

On the 19th November part of the 3rd division had occupied Siuyen, and on the 8th December the greater part of this division was concentrated there. Tachimi's brigade of the 5th division was at Howojo and had several fights with the enemy towards the north and north-east; and the rest of the 5th division was in the neighbourhood of Kurenjo.

The 3rd division having received orders to take Haicheng left Siuyen on the 9th December for that purpose. Simucheng was occupied on the 12th without any serious fighting, and Haicheng was occupied on the 13th December.

During this advance a detachment had been sent westwards towards Kaiping to cover the left flank. A large Chinese army was reported to be at Kaiping; and on the 17th December news was received that this army was marching towards Haicheng. General Katsura, commanding 3rd division was anxious to prevent a junction between this force and the Chinese troops in the direction of Liaoyang and moved out therefore on the 19th December to find and attack it. The battle of Kogasai was the result and the Chinese were completely defeated. I have no time to describe this battle, but it was a very hard day's work for the Japanese. They started from Haicheng at 4 a.m. on the 19th and after marching about all day through snow two feet deep, and fighting a battle just as it got dark, they had to start back to Haicheng during the night, and some of them did not arrive till 2 p.m. on the 20th. And all this time they had had hardly anything to eat.

The 3rd division then remained peacefully at Haicheng for about a month, and utilised the time in preparing for a Chinese attack. The Chinese made no less than four attacks whilst the 3rd division was there —on the 17th and 22nd of January and on the 16th and 21st of February. But these attacks were of the very feeblest description and were all beaten off with ridiculous ease.

On the 1st January the 1st brigade of the 1st division, which had previously moved up to Fuchou from Kinchou, started northward to take Kaiping and to communicate with the 1st army, and two field batteries and two squadrons accompanied the brigade. Kaiping was taken on the 10th January after a sharp fight in which the Japanese had to cross a frozen river—about 60 yards wide—before closing with the Chinese, who occupied a line of entrenchment on the far bank; and on the same day communication was established with the 1st army by way of Tashihchiao (Taisekikio).

The remainder of the 1st division moved north from Kinchou on the 10th February and reached Kaiping on the 20th and following days—and the division was now counted as part of the 1st army.

The outposts of the 1st brigade were then pushed forward to Tapingshan, a remarkable hill about two miles long and 180 feet high rising by itself in the middle of the plain, and therefore of considerable military importance. But on the following day about

6000 Chinese advanced from the direction of Yingtzu and occupied this hill, the Japanese outposts retiring before them. General Yamaji, commanding 1st division, recognising the importance of this position, gave orders for an attack to be made on it on the 24th February. The hill itself was carried after about an hour's fighting, but the Chinese remained in strong force in the villages to the north. General Yamaji was anxious not to advance any further, but at the same time wished to see the Chinese retreating. So he tried an artillery bombardment against one of the villages. He had four field batteries which concentrated their fire on the village for three hours, but without the desired effect; so eventually he had to send forward his infantry and the Chinese then retired at once. On this day the snow was up to the mens' knees and the thermometer stood at zero (Fahrenheit) and whilst there were only 250 Japanese killed and wounded, they had 1500 cases of frost bite.

On February 28th the 3rd division marched out of Haicheng, dispersed the Chinese in the immediate vicinity and advanced up the road towards Anzanten. And two days later, on 2nd March, Anzanten was occupied, the Chinese retreating towards Liaoyang. Part of the 5th division had been brought across country from Howojo to co-operate in the attack on Anzanten and in the subsequent movements of the 3rd division; and this force reached Anzanten, after a difficult march through the hills, on the 2nd March.

The two divisions now turned sharp round to the west, marched to Newchwang, which was captured on the 4th March, after a long day's fight amongst the houses, and then moved on towards Yingtzu. Yingtzu fell without a struggle to the 1st division on the 6th March, and on the 9th the final big battle of the war took place at Denshodai (Tienchwangtai). Denshodai is a large town on the right bank of the Liao river which was then frozen, and as the Chinese had placed over 30 guns along the river face of the town, the Japanese massed all their artillery opposite and sent their infantry against the two flanks. They had altogether 84 guns and 7 mortars in line. There was not much fighting, but many Chinese were killed in trying to escape. The town caught fire before the battle was over, and there was consequently only a small capture of loot.

And now to return once more to our own doings in the south. We at last got definite information of an approaching attack on Wei-hai-wei. The troops told off for the work were the 2nd division and the half of the 6th division which was still in Japan. They left Japan towards the middle of January and the fleet of transports conveying them assembled at Talienwan.

On the 19th January the first 20 ships with part of the 2nd division on board left Talienwan and steamed across to the north-east point of Shantung the promontory, preceded by the *Yayeyama Kan*, a fast cruiser, which arrived off the landing place at daybreak on the 20th.

A party was put into boats and sent ashore, but was fired upon by a small force of Chinese with two or three guns, so the *Yayeyama Kan* steamed close in and opened fire. The Chinese retreated at once and no further opposition was made to the landing.

It was an ideal landing place—about 1½ mile of sandy beach, with a sufficiently steep slope to allow steam launches to come to within three yards of the shore—completely sheltered from the prevailing northerly winds—deep water close in so that the ships were able to anchor about 300 or 400 yards off—and cut off from the rest of the Shantung province by a narrow strip of land, which was completely dominated by high hills. With these hills in their hands the Japanese were in an impregnable position against attack from the westwards, for any force advancing to the attack would have had to cross several miles of flat open sand, which could have been swept by the guns of the ships as well as by fire from the hills.

The disembarkation went on very smoothly and quietly till the 25th, when Marshal Oyama and his staff landed and moved to Yungcheng.

Our Admiral, Sir Edmund Fremantle, had come to the bay with the *Centurion*, the *Severn* and some other ships which were anchored to the south of all the Japanese transports and men-of-war; and I was fortunately able to obtain leave from Marshal Oyama for Lieutenant Ogilvie, the Flag-Lieutenant, to join us for this expedition, and a very welcome addition he was to our party. My only objection was that he took the wind out of my sails and sent home a very good report of the expedition before I had a chance of doing so.

The march from Yungcheng to Wei-hai-wei was made by two parallel roads, one along the coast and the other a little more inland.

The 2nd division marched by the latter and the 6th division by the former.

We left Yungcheng on the 27th January in most abominable weather. There was a bitterly cold north-west wind with a little driving snow, and the road, or rather track, was very slippery with ice; so that the ponies could with difficulty keep their feet.

We marched with the head-quarter staff, and saw nothing of the small skirmishes that took place between the advance-guard and a Chinese force which was retreating before it; but we missed nothing of importance.

The Chinese houses in the Shantung province were generally better built than those near Port Arthur, but they were even more filthy; and the only thing to be done with them was to clear out all the furniture, sweep out the floor, and put down some clean straw which was generally procurable.

On the 29th January the army was nearing Wei-hai-wei and on that day the advance-guard of the 2nd division drove in the outlying Chinese posts and pushed on to the line of the river which falls into Three Peak bay. At a place on this river called Onsento there are hot springs; and it was curious to see the Japanese bathing in them. They made holes in the dry sandy bed of the river and sat in the hot wells thus formed whilst the thermometer outside was nearly down at zero, and the stream flowing close by them was thickly coated with ice.

On the 30th it was intended that the 2nd division should occupy the

ridges bordering the harbour on the south so as to cut off the defenders of the eastern forts, whilst the 6th division, which was marching by the other road, was to hold the defenders of these forts in check and guard against any counter attack.

Whether the order was misunderstood or whether it was changed afterwards I cannot say, but the officer commanding the 6th division ordered his troops to attack and capture the eastern forts, instead of merely making a demonstration.

These forts were defended on the land side by a ditch and parapet running over the hills south of them and culminating in a commanding redoubt called Matenli.

The attack of the 6th division was accordingly made on Matenli. Matenli very soon fell in spite of the fire from the next fort Yohori, which enfiladed the attackers to a certain extent. But as soon as the Japanese occupied the redoubt they were assailed by a storm of shell from the coast forts and from some of the ships in the harbour. This fire, however, was not really very effective and did not prevent the Japanese from making use of the field guns they found in the redoubt and turning them against Yohori, which was their next objective.

It was at this time that General Odela was killed. He was directing operations in Mateli, was hit by a splinter of a shell, and died soon afterwards.

The Japanese fleet had meantime steamed into Three Peak bay and was shelling the coast forts.

The ships moved slowly in single column line ahead, describing a sort of figure 8, and as each ship arrived at the turning point nearest the forts, she began to fire, bow guns first, then port broadside, then after guns, and the next time round, bow guns, starboard broadside and after guns.

I doubt if much damage was done as the range must have been over 5000 yards. This bombardment ceased at half-past 11.

At about half-past 12 fort Yohori, which had been undergoing a bombardment from the captured guns in Matenli and from two mountain batteries placed on a hill north of Kosango, caught fire and was abandoned.

The next fort—Shakasho—was evacuated almost at the same time and five minutes later a huge column of smoke rose from Chobokushi and that was also abandoned.

One Japanese battalion had captured a small work north-westward of Matenli and as the defenders of the coast forts retreated westwards, they had to cross the front of this battalion, and few of them escaped. The ground was strewn in all directions with dead bodies—many of them burnt to a cinder probably owing to their clothes having caught fire either in Yohori or Chobokushi.

The 2nd division had advanced from the river in three columns, over the hills, chasing the Chinese from ridge to ridge, and had reached the last pass by 9.30 a.m. A battalion then made the mistake of pursuing the Chinese along the beach, and the Chinese ships in the harbour were not slow to take advantage of it; three or four of them moved in as close as they could and opened fire on the pursuing

Japanese. This fire caused almost the whole of the loss sustained by the 2nd division during the day. Surgeon-Colonel Taylor, who was fortunately in this part of the field, saw this episode; and he speaks most highly of the way in which the wounded men were picked up by the bearer company.

A last gallant attempt was made by a party of Chinese sailors to land and disable the guns in Rokakushi fort, but they were too late. They did just land, but the Japanese infantry were there and drove them back and the two last forts were occupied at a quarter to one.

The Rokakushi fort was occupied by a party of Japanese sailors who had been brought from Yungcheng for the express purpose of manning the guns in the forts. There were four 24 c.m. guns in Rokakushi, and the Japanese were able to prepare three of them for action, and whilst looking for stores and ammunition one of the men was just in time to extinguish a bundle of lighted joss sticks stuck into a powder barrel in the main magazine.

About a quarter-past one fire was rather rashly opened from Rokakushi fort against Nito fort. I say rather rashly because the sailors had not properly mastered the working of the guns and the fire was consequently very wide of the mark and only served to show the Chinese fleet that the guns were still serviceable. There had been an attempt made by the Chinese to disable all the guns, and this opening fire showed that the attempt had not been successful. Three ships accordingly, together with the island forts, concentrated their fire on Rokakushi and did a lot of damage, one enfilading shot from the *Ting Yuen* (the Chinese ironclad) cutting 10 feet of the chase of No. 2 gun clean off, killing two men and wounding two others. I have a small photograph of that gun showing what a clean cut was made. The Japanese ceased firing at 4 o'clock and 20 minutes later the Chinese also ceased.

The next day was a quiet one, but about noon the weather, which had been fine on the 30th, suddenly changed. A gale sprang up from the north, with rain at first and then snow, and it became bitterly cold.

On the 1st February the 2nd division began to move round towards Wei-hai-wei town, keeping inland so as to be out of sight and range of the Chinese ships. The left flank-guard had a fight in a snowstorm with a large Chinese force at Sonkaton and was in some difficulty, but reinforcements came up in good time and the Chinese were driven off. It appears that the Chinese were the rear-guard of a force retreating from the western forts towards Chefoo. The weather was so bad on this day that the Japanese fleet had to run for shelter to Yungcheng bay.

On the 2nd February not only Wei-hai-wei town, but all the western forts were found to have been abandoned. The guns, however, had all been rendered unserviceable.

The Japanese fleet again put to sea, but in the words of Admiral Ito "the cold was so intense that the ships were covered with ice, and blocks of ice from three to five inches thick were frozen into the muzzles of the guns."

On the 3rd February a bombardment went on during most of the day between the Japanese ships and Rokakushi and Ryobioshi forts on the one side, and the Chinese ships and island forts on the other, but very little damage was done. During the night some torpedo-boats were sent in to try and cut the boom which stretched across the eastern entrance of the harbour, but they were unsuccessful—they were found out by the Chinese guard boats and only managed to cut one wire of the boom. They discovered, however, that it was possible for boats to pass round the south end of the boom close to the shore, though the rocks made the passage very difficult. In consequence of this, Admiral Ito gave orders for a torpedo-boat attack on the following night.

The second flotilla of six boats and the third flotilla of four boats left Three Peak bay at 2 a.m. on the 5th—the third flotilla leading. They moved in single column line ahead to the boom and the third flotilla passed into the harbour successfully, but only the leading boat of the second flotilla followed. All the others got amongst the rocks. Eventually, however, three of these also got in. By this time all order in the second flotilla was lost and the boats acted independently and as it was getting late moved straight towards the Chinese ships. They were discovered by the guard boats and firing soon became general. The boats of the flotilla, which were inside the harbour, were numbers 8, 9, 19 and 21. Number 21 found number 8 with a damaged propellor and towed her out of harbour. Number 9 steered for a two-masted ship and discharged her torpedo, but almost simultaneously was hit by a shell from the ship, which smashed the funnel and pierced the boiler, killing four men and wounding four others. Number 19 found her in this condition and, taking off the survivors, towed her over to the southern shore. The third flotilla meanwhile had taken advantage of all this and had steamed quietly along westwards till it was in the southern part of the harbour. The boats had then turned to starboard and steered for the western point of Liu-kung-tao island. Suddenly a flashing of lights and discharge of rockets showed that they were discovered and a tremendous fire of guns and rifles was brought to bear on them. They kept steadily on, however, and managed to discharge six torpedoes before they retired. On the way out number 22 was chased and ran on the rocks in front of Ryobioshi fort. When day broke, two Chinese cruisers, several gun boats, seven torpedo-boats and all the island forts within range opened fire on this unfortunate wreck. She was hit several times, and one shot killed a sub-lieutenant and a seaman who were most pluckily fighting the quick-firing gun on board. The Japanese forts of course opened fire to defend the boat and at 8 a.m. the Chinese ships withdrew.

In the afternoon a small boat was sent into the harbour to the wreck from outside and took off a lieutenant and four men.

About four o'clock the Japanese were much pleased to see the *Ting Yuen* heel over and gradually settle down in the water; she had been hit probably by number 22 boat, but had kept afloat up to 4 o'clock in the afternoon.

The next night the first flotilla was ordered to attack. This

flotilla consisted of five boats. They started 50 minutes later on account of the moon, but very nearly had to give up the attempt owing to the high sea that was running outside the harbour. When they reached the boom the leading boat unfortunately ran into it, followed by all the others. This delayed them for some time, but eventually they got into the harbour all right. They had been discovered when at the boom by the Chinese and a heavy fire was opened, but without doing them any damage.

As they moved westwards along the shore they were several times lighted up by the electric light, which was fixed on the top of the island. They were not, however, observed and the light enabled them to mark the position of the Chinese ships. The boats went right round the harbour as far as Kinzan point and then turned eastwards to attack. They were seen and fired on as they approached the ships, but managed to get within effective range, fired seven torpedoes and retired out of the harbour without sustaining any loss or damage. When it became light it was seen that the cruisers *Lai Yuen* and *Wei Yuen* and the despatch boat *Pao-hua* were sunk.

On the 7th Feb. a general bombardment again took place and Nito fort wassilenced. There were two 8-inch guns on hydro-pneumatic mountings in the fort and the Japanese having got the range, as well as they could, waited till one of them appeared and then fired a salvo at it. One shot was fortunate and disabled the gun. A little later a shell from Chobokushi entered one of the cartridge stores in Nito and caused an explosion; and after this the fire from Nito became very weak and gradually ceased. The Chinese fleet took very little part in this bombardment. It appears that it was running short of ammunition. During the morning 11 Chinese torpedo-boats left the harbour and tried to escape westwards, but they were all either sunk by the Japanese cruisers or captured—some of them went ashore and were captured by the Japanese soldiers.

The absence of these boats from the harbour enabled the Japanese to look for a position near the western forts where they could place their 12 9-c.m. mortars which they had brought with them and which had hitherto had no opportunity of distinction, and after dark on the 8th they were taken up near the outer fort and placed behind a ridge there.

On the 9th the general bombardment began again. The *Ching Yuen* and the *Tsi Yuen,* two Chinese cruisers, joined in on this occasion, but a long range shot (6200 metres) from Rokakushi fort hit the *Ching Yuen* and she gradually sank stern first. At the western entrance the Japanese mortars completely silenced Koto fort (which is the fort at the western end of the island, low lying and unprotected against high angle fire) and in the afternoon they were turned against the *Chen Yuen,* a Chinese ironclad which was lying about 2200 yards off, and succeeded in making her move out of range.

There was another bombardment on the 11th for a short time and on the 12th the Chinese gave in and sent out a gun-boat flying the white flag with a proposal for surrender from Admiral Ting.

The surrender took place on the 16th and by the end of February

all the Japanese troops had returned to Port Arthur and Kinchou except a small force left behind to hold the island. All the guns on the mainland were effectively disabled before the army was withdrawn.

Peace negotiations then began and though the two remaining divisions of the army, the 4th and the Guards, were brought from Japan to Talienwan and everything was made ready for an advance against Peking, the war came to an end.

Whilst the peace negotiations were going on I made a short tour round the northern battle-fields from Yingtzu, and then waited at Port Arthur for the final ratification of the treaty. The Red Cross hospital at Yingtzu deserves mention. It was started by an English doctor there, assisted by others, both English and American, and was most successful, and to show that there was some spirit in the Chinese private soldiers, they assured me that a good many men had been brought in wounded, had been cured and discharged, and that then instead of going to their homes, as they might have done, they went once more to the front and were again wounded and brought in.

At Port Arthur I found the men of the 6th division constantly at exercise in the morning, at physical drill, running and marching about over the hills; and in the evening they used to parade the streets in parties of about 20 singing their regimental songs, and they did it all as if their lives depended upon it.

I finally left Port Arthur with army head-quarters and as the ship steamed out of harbour the band on shore was playing "The girl I left behind me" and "Auld Lang Syne," and it will be a long time before I forget the hospitality and kindness of the many friends I met in the Japanese army.

DISCUSSION.

Chairman—Would anyone like to ask Captain Du Boulay any questions or to make any remarks on the lecture we have heard.

Colonel F. G. Slade, C.B.—I should like to ask the Lecturer if he could tell us in what form the infantry attacked the eastern forts in the general attack upon Port Arthur. As he said that at Port Arthur they crossed over open ground under a heavy artillery fire, I should like to know in what formation they did it.

Lieut.-Colonel J. R. Jocelyn—I should like to know the range of the salvo which knocked over the disappearing gun when it did appear.

Chairman—I should like to ask if you would kindly tell us what the telegraph work was; you have not mentioned, in dealing with the latter part of the subject, how the different columns were connected by telegraph.

REPLY.

Captain Du Boulay—Hasegawa's brigade attacked in two lines, one 450 yards in rear of the other. There were two attacks the right and the left. In the right attack the front line consisted of five companies extended—*i.e.*, each company had two sections extended and one in support close up.

Chairman—In extended order or not?

CAPTAIN DU BOULAY—No, not in extended order. The second line was composed of two companies in close order, in line. The left attack was in the same way in two lines 450 yards apart—the front line consisted of two companies extended and the rear line of two companies closed. The general said that he expected to have enormous loss when he saw shells bursting right amongst his men, but fortunately the shells were almost all common shells and very little damage was done. In that advance the three battalions lost seven killed and 86 wounded. In the attack on the other forts the formation was very much the same.

As regards the range of the salvo, I can measure it on the map. It was about two miles. The guns that were used were 24 c.m. guns.

With regard to the telegraph, the Japanese found an existing line running from Fusan to Seoul, and on to Wiju and Howoji, and another from Seoul to Gensan.

When the 2nd army landed at Kayenko a field telegraph was laid as it advanced towards Kinchou; and subsequently Kayenko and Takushan were connected by field telegraph; but, though the landing at Kayenko took place at the end of October, these two places were not connected till the 30th December. The delay might have had serious consequences, as the general at Haicheng could only communicate with the 2nd army by way of Kwimpo or the Ping Yang inlet, and ships were not always ready to carry messages across to Talienwan.

There was an existing line running up the Liaotung peninsula from Port Arthur to Yingtzu, so that the 1st brigade, when it moved north, was able to communicate with the general commanding 1st army by Kinchou, Kayenko, Takushan and Haicheng.

Of course the existing lines had to be worked and kept in working order by the Japanese field telegraph troops.

CHAIRMAN—Had they any line of telegraph on the direct line of advance?

CAPTAIN DU BOULAY—They had the existing line on the Howojo road and a field line on the road to Haicheng.

For the attack on Ping Yang the only telegraph line used was that along the main road from Seoul.

MAJOR F. G. STONE—I should like to know the class of horses the field batteries had in their teams, and what were the general means of transport in addition for the ordinary baggage trains and so on.

CAPTAIN DU BOULAY—The Field Artillery horses are the ordinary ponies of Japan, standing about 13-3, and all the movements of the artillery are necessarily somewhat slow. The regimental transport was performed by pack ponies, but the other transport, that is to say, the divisional ammunition and supply columns, and the line of communication transport, was done by Japanese hand carts, each drawn by three coolies. For the advance north from Kinchou a lot of Chinese wagons were used. This model, produced by the Secretary, as a Chinese wagon, is really a Chinese carriage, but the wagon is very much like the lower part of it. It is drawn generally by five, six or seven animals of different sorts; mules, ponies, donkeys and oxen; all harnessed in together. These wagons carry heavy loads and go great distances. In some cases stores were carried on the backs of coolies or by two coolies with a bamboo between them. The mortars I spoke of at Wei-hai-wei and all the stores belonging to them were carried in this way,

CHAIRMAN—I think I have only now to offer our hearty thanks to the Lecturer for the very interesting lecture he has given us, which certainly has entertained me very much. I tried to learn as much as I could while the war was going on, but he has certainly given me a good deal of information which I had not before, especially with regard to the extent of the movements which were going on without

the telegraph which I had assumed must have been carried on by telegraph, for I could not have conceived they would have been carried on with such success as they were without some such connection. As far as I can gather, after the passage of the *Yalu* the telegraph was used for the connection of the columns pretty completely.

There must have been a large use of the wire; I have been always anxious to know how far it did take place because it seemed to me that the series of complicated movements carried out there could hardly have gone on without some such explanation, but it is less complete than I confess I thought it would have been, because I had always supposed every movement must have been regulated by wire; but the completeness of the organisation which Captain Du Boulay has described to us and the perfect training which had taken place beforehand, no doubt enabled them to carry out the whole of that vast series of operations with much less connection than I should have supposed to have been absolutely necessary for the series of movements which were carried through without a hitch.

At any rate I think at this time it will be sufficient for me to thank Captain Du Boulay for the very interesting lecture he has given us and to say how very grateful we are to him now that he has just come back from one of the most interesting campaigns which have taken place in our time, for telling us all he can about it.

THORN, WOOLWICH

THORN, WOOLWICH

LETTERS

WRITTEN BY

LIEUT.-GENERAL THOMAS DYNELEY, C.B., R.A.

WHILE ON ACTIVE SERVICE

BETWEEN THE YEARS 1806 AND 1815,

ARRANGED BY

COLONEL F. A. WHINYATES, *late* R.H.A.

During the preparation of the Swabey Diary there were brought to the notice of the editor a number of letters written to members of his family, and to an intimate friend, by the late Lt.-General Dyneley, C.B., during his active service between the years 1806 and 1815. It is to be regretted that some of the series are missing, but those which remain and are now published are of such interest and so entertaining that no apology is needed for their production. A few words about the writer of the letters by way of introducing him to the reader may not be out of place.

Thomas Dyneley (one of a family of fifteen) was the fourth son of Robert Dyneley of Bramhope, Yorkshire, Esquire. He was born on November 23rd, 1782, and as a 2nd Lieutenant entered the Royal Artillery, December 1st, 1801. He was in Italy with Sir James Craig's force in 1805, and the following year volunteered to accompany the expedition under Sir John Stuart to Calabria, where he was present at the battle of Maida and siege of the castle of Scylla.

In 1811, he embarked for the Peninsula with 'E' troop, R.H.A., as 2nd Captain. There he served at the sieges of Ciudad Rodrigo (wounded) and Burgos, at the battles of Salamanca, Vitoria and those in the Pyrenees, besides other minor engagements, being also wounded in the attack on the forts of Salamanca. In November 1813 he was invalided home and did not rejoin his troop till its return to England in 1814. He received the Peninsular medal and five clasps. The following year he accompanied 'E' troop to Belgium and was in the retreat from Quatre Bras and at the battle of Waterloo, for which he received the medal and a brevet majority, and in 1838, the C.B. He was made A.-D.-C. to the Queen in 1841.

He commanded 'E' troop from 1825 to 1834. Subsequently he was in command of the Royal Artillery in Canada from 1847 to 1852, and in Dublin from the latter date until his promotion to Major-General in 1854. Lieutenant-General Dyneley, who died in London in June

1860, married in 1827, Mary Frederica, eldest daughter of Edward Law, Lord Chief-Justice, first Lord Ellenborough, by whom he had three sons and one daughter. The eldest son, Edward Eldon,[1] entered the Royal Artillery. The second, Henry Ellenborough, entered the Madras cavalry. The youngest, Douglas, became Adjutant 23rd Fusiliers, and was mortally wounded at the attack on the Redan on 18th June, 1855.

His daughter is the present Miss Dyneley through whose instrumentality, together with that of her cousin, Miss Baynes, the following correspondence has been brought to light.

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[1] Captain E. E. R. Dyneley (Kane's List, No. 2092) served at the Cape of Good Hope and saw much rough work against the Boers. He was present with two 6-pounder guns when they were defeated by the force under Lieut.-General Sir Harry Smith in August 1848 at the battle of Boompaatz, during which operation the troops marched between 1000 and 1200 miles.

Dyneley went to the Crimea in 1855 as 2nd Captain of 'A' troop. At the conclusion of the war, during the voyage home, the transport in which the troop was embarked took fire, and the danger was imminent, the conflagration being adjacent to the magazine. Lt.-Colonel Lysons, 23rd Fusiliers (now Sir Daniel), who was on board, in talking of Victoria Cross incidents in later days, said, "that the finest thing he ever witnessed was when (Tom) Dyneley led the way down to the hold of the burning transport, and directed the removal of the charred and burning ammunition boxes and handed them up to the deck himself."

Captain Dyneley went in command of 'J' battery, R.A., to India during the mutiny in 1857 He died of fever at Calcutta, May 4th, 1858, deeply regretted by his brother officers.

Owing to the state of affairs in Europe in 1806, England sent troops to the Mediterranean and thus was established in Italy and Sicily a garrison of the Royal Artillery which remained in those countries for some years. In July of that year an expedition of about 5000 men under Sir John Stuart was sent from Sicily into the Neapolitan province of Calabria to assist the forces of the King of Naples in their struggle against those of Napoleon. On the 6th, the French under General Regnier were signally defeated at the battle of Maida and the castle of Scylla was afterwards besieged and taken. Letter I. describes these events.

Though over-shadowed at the time by the victories of Ulm and Austerlitz, the moral effect of the battle of Maida had a most important influence upon the progress of the war. A desire to adopt a more vigorous military policy was aroused in the public mind in England, which resulted eventually in the Peninsular war.—Ed.

LETTER I.

(To Captain J. K. Douglas, R.A.)

Messina, *August 14th, 1806.*

I doubt not ere this, my dear John, you have heard of our late exploits.

I sailed from Malasco about June 26th, arrived at St. Euphemia on the 31st, and disembarked at 1 a.m. next morning. Soon after daylight a few French gentlemen made their appearance; a regiment was sent to their assistance, about 180 were killed, wounded and taken prisoners, "the rest they ran away," but soon afterwards gave themselves up as prisoners. Nothing extraordinary happened until July 3rd, when a sergeant who was straggling from camp was shot through the head by a Frenchman who had concealed himself in a bush. At 10 o'clock that night I received orders to march with two guns under my command, and after marching all night, at daybreak found myself on the plain of Maida; owing to the dreadful state of the roads only four officers were able to get their guns into the field, one of whom I had the honour to be. We advanced about three miles and came upon some skirmishers placed to lead us on; and a slight "poppery" took place. We then discovered General Regnier in a most beautiful and commanding position in a wood of full blown myrtle bushes as white as snow with between 7000 and 8000 men, including 500 cavalry, of which we had none. It was an anxious moment as we had only about 5000 men in the field. Had the enemy kept their position, I think, between ourselves, the wisest thing would have been to have made the best of our way on board ship again, for it would have been impossible to have moved them; but they were too confident of success. Their General told them the English were advancing loaded with riches and that they would go down, plunder and drive them into the sea. And sure enough down they did come, in line, in the finest order it is possible to conceive.

We halted, formed in line to oppose them, and then advanced. It

would be out of my power to describe with what steadiness we came on. I was at this time on the right and about 10 yards in front of the light infantry. The French advanced firmly towards us, keeping up a tremendous fire of musketry which either fell short or went over our heads. When we were about 100 yards apart, Colonel Kempt, who commanded the light infantry,[1] with incredible coolness gave the order "Halt!" "Throw down your blankets, shoes," etc.; then the order "Forward!" and in a few seconds after "Charge!" Our men reserved their fire until within a few yards of the enemy and then fired in their faces. The French turned tail and those who could run fast enough escaped the bayonet, the whole of the rest were either killed, wounded or taken prisoners;[2] in short, Bonaparte's favourite 1st Regiment of infantry was cut to pieces. The field presented the most distressing spectacle, being covered with killed and wounded.

From the rapid way our light infantry went off I was unable to follow them, having to mount my guns on horses' backs; however, seeing another body of our troops coming up, I joined them.[3] But after firing a few rounds of grape, I was served in the same manner by their making a charge and leaving me.

I then again mounted my guns and went to the left, where I found a steady fire being kept up on the enemy's cavalry, who threatened to charge that flank, but they scarcely ever came within gun shot. I could see the General trying to get them on, but all to no purpose; they then retired in the greatest order under a very heavy fire amidst the cheers and hisses of the whole of our troops; in short, they were fairly hissed off the field and old John Bull was left "Cock of the Walk." There was a very fine field of wheat which our men by mistake set on fire at the commencement and which continued burning the

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[1] "The corps which formed the right of the advanced line was the battalion of light infantry commanded by Lieut.-Colonel Kempt,* consisting of the light companies of the 20th, 27th, 35th, 58th, 61st, 81st and Watville's, together with 160 chosen battalion men of the 35th Regiment under Major Robinson." Extract from the despatch of Sir John Stuart.

*Later Sir James Kempt distinguished in the Peninsula and at Waterloo.

[2] It has been asserted that the French and English crossed bayonets at the battle of Maida; the following extract however, on the authority of Colonel Kempt, fully corroborates Lieutenant Dyneley's statement of what took place on that occasion:—*Ed.*

"I know that the French soldier advances to meet the British bayonet with more hesitation, I will not say trepidation, than he would meet any other enemy. The British soldier rejoices in his bayonet." No two lines have ever crossed bayonets in battle. I was often assured that it was done at the battle of Maida, but I did not believe it. Long after the battle, Sir James Kempt, who commanded our battalion of the 49th Regiment making that charge, declared in my presence that the bayonets did not cross. The French while advancing hesitated, and at last turned and ran away; but they delayed too long in doing so; the British rushed in and laid upwards of 300 of them on their faces with the bayonet. Very many years afterwards I repeated this to Commodore Sandham of the Navy, who said to me: I am glad you mentioned this matter to me, for I was that morning a Lieutenant in one of the ships which landed our forces in the bay of St. Euphemia, and witnessed the action from our decks. After the battle was over the men were re-embarked, together with many wounded French soldiers, and it was curious to see the wounded in the "sick bay" the following morning—all the French on their faces, being stabbed in the back; while all the British lay on their backs, being shot in front by the volley which the French fired as they advanced to the charge." "The life of James FitzGibbon, a veteran of 1812," pp. 303-4.

[3] "Brigadier-General Acland, whose brigade was immediately on the left of the light infantry, with great spirit availed himself of this favourable moment to press instantly forward upon the corps in his front; the brave 78th Regiment commanded by Lieut.-Colonel Macleod, and the 81st under Major Plenderleath both distinguished themselves on this occasion. The enemy fled with dismay and disorder before them, leaving the plain covered with their dead and wounded." Extract from despatch from Major-General Sir John Stuart. Camp on the plain of Maida, July 6th, 1806.

whole of the action. You may suppose the confusion we were in from the intense heat of the sun and this fire. We then marched a few hundred yards further and took up the enemy's ground where we rested about two hours and, after taking what little refreshment we had with us, returned to the beach about five miles distant from the field, where we remained that night.

Our loss on that day was only one officer and fifty men killed, ten or twelve officers and two hundred and sixty men wounded; the loss on the French side is estimated at nearly three thousand.

Our General had meanwhile received information that the enemy were collecting their force at Catauzaro, our troops therefore, excepting about five hundred men, marched the next morning to oppose them. We reached the town of Maida where we found a hundred wounded, whom we dressed and sent aboard a ship.

That evening soon after our arrival, the General received fresh information to the effect that the said force had fled in all directions; we then turned and marched directly across the country for Scylla where there was a castle held by 200 Frenchmen who refused to surrender. All our field-pieces were embarked at Montelerone, excepting two 6-pounders and one howitzer which were conducted to Scylla by Captain Pym[1] and myself, and terrible work we had; however, we arrived there safe on the 13th. Batteries were soon made and we opened fire, which was constantly kept up until the 23rd, when we had also three 24-pounders in position. In my battery there were both a 12-pounder and a howitzer, the noise from which shook my head; for the whole day was employed in firing as much as the guns would bear, etc., and we showed the scaling ladders within 100 yards of the place to let the enemy see what we meant to do if they did not surrender. A flag of truce was sent in that evening to ask their terms. They demanded to march out with the Honours of War and join their nearest post. We allowed them to march out with the Honours of War, but took their arms from them, and sent them in one of our transports to Toulon.

I was very well when the flag of truce went in, but before it returned I was seized with a violent chill and a fever. I instantly went to bed, which consisted of church banners and a blanket. I remained in this condition with my clothes on (which by the by had not been off once during the whole trip), all that night and the next day, I then got a comfortable bed in the town; however, I got worse, and the next day went over in a boat to Messina. That best of men, Mr. Burgmann,[2] came directly and wanted to have me in his house, which the surgeon at that time did not approve. He was always with me and everything for which the surgeons or I wished, I had at once in the most comfortable manner. I don't know what I should have done had it not been for Mr. Burgmann and Captain Pym; the latter never left my bedside day or night during the whole of my illness. The fever took a turn on the 2nd, and I gained strength faster than I had lost it. I got up on the 3rd and on the 4th went to Mr. Burgmann's, where I have been most com-

[1] Captain B. Pym (Kane's List, No. 802).

[2] Grandfather of Colonel George Burgmann, late Commanding R.A. South Eastern District.

fortably settled ever since, and have gained strength till I am quite stout. During my illness I received positive orders to return to England immediately. The Colonel,[1] who commanded us, called to see me yesterday, and said if I wished to remain I might, provided he returned me "sick" to head-quarters, and that I wrote an official letter to General Macleod. To this I readily agreed, and have written stating that I am convalescent. I must not forget to give you the most essential part of our trip to Calabria. Up to the day we left we had lessened the French army by 4,500 men,[2] and our loss (including the late sickness) only amounts to 450.

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[1] Lieut.-Colonel John Lemoine (Kane's List, No. 635).

[2] The Duchess d'Abrantes (Madame Junot) states the French loss at 5000 men. D'Abrantes Vol. IX., p. 136.

The scene changes now to the War in the Peninsular in 1811. Letters II., III., IV., V., VI., and VII. deal with the Sieges of Ciudad Rodrigo and 3rd of Badajos, with the movements of the covering armies for those operations, and the return of the army to Portugal the beginning of 1812.—Ed.

LETTER II.

(To Mrs. Dyneley.)

Lisbon, *September 26th, 1811.*

This is really too bad, my dearest Mother.

A packet arrived yesterday, making the fifth since I left England and only one letter from your party, not a single line from that lazy fellow Robert.[1] He would of course tell you that I had been unwell and obliged to be left behind when the troop marched. Perhaps it was quite as well that I was, for they must have had a terrible time of it, the heat is beyond all imagination. I have already got back ten of the troop who have fallen sick upon the road, and are obliged to come into hospital. Notwithstanding the healthy accounts the papers give, the sickness in the army has been dreadful. In this hospital alone we have 220 men of the artillery, and are daily expecting more, who are on the road. I heard a medical man say yesterday that, at this moment, the army had at least 19,000 sick, but as the cool weather will very shortly set in we may expect a great part of them to be very soon fit for duty.[2] As for myself, I feel I am completely recovered, but Fitzpatrick, who knows me better than I do myself, (having attended me in the whole of my sickness in Sicily), says I had better wait a little longer until the cool weather sets in. But, though I take his advice, my remaining here keeps me in perpetual hot water, for I am in hourly expectation of an order to remain altogether, and such an order would certainly drive me mad if the troop were to be engaged and I not there. The letters received from the army this morning (September 26th) are of the 18th, they say that by the manœuvres of the enemy it is thought he will either give us battle in

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[1] His brother.

[2] Lord Wellington writing from Fuente Guinaldo, August 27th, 1811, says: "We have a great many officers and men sick, but none very seriously so. It is astonishing how easily the officers and soldiers of our army are affected by sickness, and the little care they take of themselves. In some situations also the effects of climate are terrible. Very recently the officer commanding a brigade of artillery encamped them in one of the most unwholesome situations, and every man of them is sick. However, the weather will soon become cool in this part of the country, and I hope there will be an end of the sickness."

And again from Feueda, November 8th, 1811; "I believe we had at one time more than 17,000 sick and wounded, but 7000 or 8000 were wounded. I never saw any army so unhealthy. Every man that came out from England went to the hospital immediately after, if not before he joined the army, and several of the old Walcheren cases appeared again. We have lost but very few, and they are now recovering, but we have still 14,000 in the hospitals.

four days, or not for as many months. If such is the case it will be some satisfaction to me to feel that even if I had not been sick I could not have been present, as the troop which marched on the 10th instant could not arrive at head-quarters before the 2nd or 3rd of October.

Tell Robert that as I was riding yesterday with a party, a gentleman bowed to me several times, but not knowing it was to me I took no notice. Afterwards, however, I recollected his face, and on enquiry found his name was Forbes. I think I now remember having met him somewhere in company with Robert, however I shall make him out the next time I see him.

By this time I daresay you will have heard of the arrival of the young Lyon's,[1] theirs has turned out but a very sorry trip. William, when he left this, was determined to return in the garb of a soldier, but before now in all probability has altered his mind.

Robert would tell you that Taylor[1] had marched with the troop, who by the last accounts were all well. I daresay by this time that said gentleman is heartily sick of his campaign and is beginning to wish himself back in Old England.

You will see by the enclosed "pawnbroker-like" looking paper that I had an invitation to dine with his Britannic Majesty's Envoy, Mr. Stuart, the day before yesterday, which I accepted and had a remarkably pleasant day. He lives about six miles out in the country and I was nearly two hours going and managed to get there just as dinner was half over; however, I did not feel it much as six or seven people came half-an-hour after me.

September 27th.—Our letters from the army are of the 22nd instant. It appears it is the enemy's intention to throw a large convoy of 800 cars into Ciudad Rodrigo. They have 40,000 men at Salamanca independent of Marmont, the head of whose columns is on the Rodrigo side of Puerte de Baños. At present, with the exception of the light division and Captain Ross's troop R.H.A., the whole army is on this side, but at so short a distance from the Agueda, that, should the enemy advance in any force, Lord Wellington can get across in the night to attack them. The attempt was expected to be made when the accounts left the army and it was reported they were all to be in motion the next morning at daylight. Therefore it must be decided by this time. They say the French, whose armies are close together, are moving on, and our lads are in hopes they will attempt to cross the Agueda, in which case Lord Wellington will certainly give them battle. They have 6000 cavalry while we have but 2500.

I dined yesterday at the house of two Yorkshiremen, merchants in Oporto, and there met one of the young Becketts, what he is I have no idea, but should suppose a merchant also. We are going a party tomorrow to Cintra and I have lent him one of my horses. I shall have him to dine with me and shew him what attention lies in my power. I have been daily gaining strength, and Fitzpatrick has just told me that he shall be able to let me go up to the army about the 4th. Reed[2]

[1] The brothers Lyon's and Taylor were gentlemen volunteers who sailed with 'E' troop, R.H.A. for the Peninsula. They are mentioned in the Swabey Diary.

[2] His servant, Gunner Wm. Reed.

is still in hospital; he has been very unwell, but will be out by that time.

It is a great undertaking going by myself, but I shall have nothing to do when I have finished my day's march but refresh myself for the next day.

I shall not, of course, send Lord Wellington's or General Hill's letters to them, as they are letters of introduction, and are intended for me to deliver myself.

General Hill had a pack of hounds landed yesterday from England, but I fear I shall not be near enough to them to partake of the sport.

The authorities have altered their way of dealing with the inhabitants for certain crimes; they now hang for murder, but before the English came, unless a man confessed his guilt, he was not hung. We hung two men this morning, one was a barber, but instead of shaving a poor fellow he almost cut his head from his body, and confessed he merely did it because he knew the man had change for a dollar about him, which he took and made off with. The murderer's head has been exposed for several days stuck on the end of a pole at his house, in which his family are now living with the greatest unconcern.

All my horses continue remarkably well, and as for old "Maida," she is so fat she can hardly walk, and what is very singular, she lives almost entirely on figs. I have watched her in the garden and seen her eat between 15 and 20 at a time that have fallen ripe from the tree. My goat I have sent up country with the troop. I suppose by the time this reaches England you will have left Shaston, I shall therefore address this to Robert that he may forward it to you. I wish you would see that some of those lazy people about you write to me every packet. They can have no excuse; but with me it is really by an undertaking, and I am obliged to stick to it.

Lisbon, *28th September, 1811.*

LETTER III.

(To Captain J. K. Douglas, R.A.)

Fuentes d'Onoro,
January 22nd, 1812.

As you will see my name among the wounded, my dear John, I do flatter myself you will all be happy to hear that I am now perfectly recovered. I got a thump on the head from the splinter of a shell on the 15th, which brought me to the ground. I bled a good deal at the time and, having near two miles to walk to hospital, I became a little sick; however, I soon got the wound dressed, borrowed a horse, and was back at the guns in less than an hour and a half, by which you may suppose I could not have been much hurt. For the next eight and forty hours I felt a little queer, but since then have not found the least inconvenience. You will wonder what business I had at Rodrigo. I will tell you. At the time the siege was first talked off, Colonel Framingham[1] happened to be staying with the troop, and he kindly wrote to General Borthwick[2] requesting he would employ me. Not hearing from him in answer, I set off to head-quarters at Gallegos, where the General told me he had not received "Fram's" letter, but that, even had he done so, it would be impossible for him to ask Lord Wellington, as he had already refused an application he made for Henry Baynes' company [3] to be employed. I told him I had a letter of introduction from the Chancellor [4] to his Lordship, and if he would only introduce me I would ask myself. He agreed to do so and I set off next morning and was in the battery by daylight. At 12 o'clock I came out and was introduced to his Lordship, who said, in answer to my request: "Certainly, put yourself under Major Dickson".[5] The Major was much pleased with my offer and put me on duty at 2 o'clock, where I remained until 2 o'clock the next day. I do assure you the duty has been pretty severe, 24 hours on and 24 hours off, and we crowned it all with a most brilliant storm. I went down with our troops, merely intending to see them make the start, but when there I thought I might as well see the whole of the fun, and made one of the party to enter the breach, and certainly it was a very fine thing. As soon as the French suspected we were coming they threw a quantity of hand grenades and light balls from a 13-in. mortar which enabled them to see completely the whole of our troops. Our columns then pushed on and the whole business was finished in less than a quarter of an hour. The sight in and at the top of the breach was dreadful. We absolutely trampled the poor wounded fellows to death. The enemy soon left the ramparts, and the scene of plunder, that took place afterwards, was dreadful to a degree. The poor

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[1] (Kane's List, No. 524.)

[2] (Kane's List, No. 553.)

[3] 2nd Captain H. Baynes commanded Captian J. May's Company 1st battalion in his absence as Brigade-Major R.A.

[4] John Scott, created Baron Eldon in 1799, and Lord High Chancellor in 1801.

[5] (Kane's List, No 844.)

wounded on both sides were entirely stript in less than half an hour; fellows got drunk, and by 12 o'clock half the town was in flames. I am not far wrong when I say that more than half of our killed were killed by our own people; however, this is only for your own private ears, it is too disgraceful for the English name to relate. We lost General Mackinnon, blown up; General Craufurd was mortally, and General Vandeleur[1] slightly, wounded.

The fire upon our batteries was really so hot that it was almost impossible for the men to stand to their guns. The Commandant of the French Artillery says himself that he threw 1000 shells into our batteries, and I must do them the justice to say, artillery could not have been better served.

I know not what your mother will say when she hears I was present, her last words to me at St. John's Wood were: "Mind Dyneley, let's hear of none of your volunteering." My last letters from home tell me the General[2] has been unwell, I hope he is not so now.

Tell Robert I wish he would call at Adam's, 60, Fleet Street, and tell him the glass he sent to Bloomsbury Square is really about as bad a one as I ever looked through. It was the one Taylor gave me, and he was not stinted in price, the only object was that the glass should be good. I bought one at Portsmouth for 30s., which is acknowledged by every one to be quite as good if not better. Tell R. to abuse him well.

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[1] Major-General Vandeleur afterwards commanded a brigade of Light Cavalry at Waterloo.

[2] General Robert Douglas (Kane's List, No. 424), Colonel-Commandant Invalid Battalion and R.A. Driver Corps, his family were intimate friends of the Dyneley's; this letter and others are written to one of his sons, 2nd Captain John Kearsley Douglas (Kane's List, No. 1070.)

LETTER IV.

(To the Same.)

Maguilla, Estremadura,
March 30th, 1812.

Having a few leisure moments my dear John I do not think I can apply them to a better purpose than that of thanking you most kindly for your letter of February 17th. I think my last to Mrs. Close[1] was dated February 23rd, since when we have been continually on the march.

On the 25th of this month we started from Azeuchal to surprise the garrison of Llerena. After marching the whole of that day and night we arrived before the place at daylight the next morning, but by some unfortunate accident the Chasseurs Britanniques fired upon the 51st Regiment or the 51st fired upon the Chasseurs, it is not yet decided which were the aggressors, but certain it is that an assistant surgeon and two men of the 51st were killed, and the paymaster, one officer and one man wounded. This fire disturbed the garrison, and while we were dismounting they marched out on the other side of the town. We then advanced to within about 500 yards of the town and by order of Sir Thomas Graham (who commanded the whole) opened our fire upon what, he said, were troops forming in front. We were rather astonished at the fire not being returned, but at daylight we discovered we had been pounding away at a brick wall. We then went round to the other side of the town, when we saw the enemy, about 3000 infantry and 500 cavalry, half a mile ahead going over the mountains. The cavalry then pushed on with Bull's troop, which opened fire, but at too great a distance to annoy them at all, and the whole party got clear off without losing a man. Thus ended our "surprising party." We marched into Llerena, where we remained that day, and marched again from thence to this place at daylight the next morning, the 27th, where we have been ever since, expecting to move every hour. At this moment in consequence of some information Sir Thomas has received, Bull's troop is ordered immediately to the front to support the cavalry. The report is that the "surprisers," consisting of 10,000 men, are to make the best of their way to the rear as Marmont with 30,000 is about to form a junction with Soult and Count Dorsenne with 30,000 more for the relief of Badajos. Should it not fall before he is able to carry this into execution, I have no doubt we shall leave our bones on the plains of Albuera. We have not had any news from Badajos these three days. Lord Wellington sent word to the Governor to say that if a single Englishman lost his life by the springing of a mine, he pledged his word that every Frenchman should be put to the sword. I should have liked much to have been in the siege, but General Borthwick refused to forward my application, and I could not get away on leave from my division, as we were in expectation of moving every instant, so that I was prevented speaking for myself. You will be

[1] Mrs. Close was a daughter of General Douglas. Married Major Douglas Close, for many years employed in the India Office.

sorry to see poor George Macleod[1] is badly wounded; his leg is not broken as was at first reported; his wound is in the thigh by a cannon shot which has torn some of the muscles and otherwise contused it, I hope the poor fellow will not suffer much, for he is as fine a soldier as ever breathed.

In a letter I received a few days since from Mrs. Close she tells me William has not yet returned; remember what I said about him and don't let him come to this climate yet, let him stay in Old England and enjoy himself upon roast beef and port sauce and then, if he will come, tell him to contrive it so as not to land before October, the heat before that time is dreadful. Robert[2] I have not seen, but I understand he is fitting out a 9-pounder brigade at Lisbon. I wish he could have been up in time for our fun, but I am afraid it is impossible.

I assure you your offer of the greyhound will be most acceptable. Can you imagine anything more tantalizing for a man fond of the sport and probably very hungry at the time, than to be able, in a ride of half an hour, to put up half a dozen hares, and not a dog to slip. We care nothing about "the season," there are no game laws, and, as for the "campaign" being opened, we can find time to fight and course too, therefore if you will take the trouble of forwarding the dog I shall be much obliged to you. If a surgeon of ours, Bennett[3] by name, is at Portsmouth, he will take charge of it, or Colonel Salmon[4] I daresay can put you in the way. I had a white dog I stole the night we entered Rodrigo, but in the hurry of our forced march to Llerena, somebody cut it loose from my baggage in the night.

I have been very fortunate with my horses, not having had a sick one since I came into the country. Tell William to let his be small, stout nags, about six or seven years old; they require less to eat, and you may get a stable for a small horse when you cannot for a large one, the ceilings and doors of the stables are mostly very low, being made for mules and donkeys. We Horse Artillery gentlemen touch up the little gunner-driver men's horses in high style, indeed I don't know what we should do without them. We got a draft of forty from Massey[5] at Colchester and most capital horses they are.

You will not be surprised from what I said in those few hasty lines from Fuentes d'Onoro to hear that General Borthwick has resigned his

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[1] There were four sons of Major-General Sir John Macleod, K.C.B., D.-A.-G. Royal Artillery, who served in the Peninsula, viz. :—

Charles, commanding the 43rd Regiment, killed at the storm of Badajos. Lord Wellington wrote in his despatch, "In Lieut.-Colonel Macleod, who was killed in the breach, His Majesty has sustained the loss of an officer, who was an ornament to his profession and was capable of rendering the most important services to his country."

James, A. (Kane's List, No. 1210), in the Royal Artillery, he was at Walcheren, and through a great part of the Peninsular War; he was afterwards transferred to the 41st Regiment.

Henry, G. (Kane's List, No. 1393), who began his career in the R.A., but was transferred to the 35th Regiment, he was badly wounded at Quatre Bras.

George (here mentioned) began his service as a midshipman, but was transferred to the Royal Engineers he led the forlorn hope at Ciudad Rodrigo and was badly wounded at Badajos.

[2] Captain Robert Douglas (Kane's List, No. 958).

[3] (Kane's List, No. 81).

[4] (Kane's List, No. 655).

[5] Captain Commissary G. Massey (Kane's List, No. 36).

command in this country and that Framingham is ordered to take his place.

I am writing without the smallest prospect of being able to send my letter, I shall therefore keep it open in hopes of being able to tell you some news, at present we have none.

LETTER V.

(To the Same).

Villalva, *April 2nd.*

Here I am my dear John having left Maguilla two days since. I believe it is not intended we should fall further back at present, but wait here to see if Soult thinks proper to come on. The report at present is that he cannot get together 45,000 men; it is certain that at Badajos, Philippon has offered to capitulate provided he may march to join the nearest division of his own army; of course this has not been agreed to. I hear them pounding away there as I sit writing.

I have this instant seen dear little Bobby Lawson[1] who tells me Robert is by this time arrived at Elvas with his 9-pr. brigade.

I see a great difference between the opinion of the people of Spain and that of Portugal as to the French. The Spaniards in the towns where I have been do not appear to dislike them much, but the hatred of the Portuguese is beyond all belief; it must however be remembered that the French left every town they passed through in Portugal a perfect ruin. In Spain they have not destroyed a single house; the inhabitants pay their contributions and are at peace.

The "patron" of my house at Villa Franca, asked me yesterday why the Highlanders wear the kilt. I told him because it was the custom in Scotland. He pressed me much to give him some other reason, and then told me that the Count d'Erlon had informed him that the regiments had lost their colours in Egypt, and that therefore the King of England had disgraced them by taking away their breeches; not so bad. He also said that Mortier told him he came into this country with 20,000 men, that he had since received two strong conscriptions, but that at that moment he could not bring 7000 men into the field.

[1] Captain R. Lawson, (Kane's List, No. 943).

LETTER VI.

(To the Same).

Toro del Almendral, *April 6th, 1812.*

We arrived the day before yesterday at Santa Marta and the next day came an order for two guns to go back immediately, of which Macdonald[1] took the command, while I received orders to march to this place and arrived late last night. A report is current that the enemy is coming down very fast and will most certainly give us battle at Albuera which is only two leagues and a half from us. As I fancied old Dame Fortune, with whom I by no means think I have been out of favour through life, might let me have the command of the four guns, I set off this morning at daylight to look at the old ground and thought what you would have given for such a ride. I pressed into my service a young man of the 48th Regiment, who was in the action, and he explained the position of both armies to me. One or both sides must have been a good deal hurried, for in one part of the field there is a trench dug nearly two hundred yards long, into which all the dead have been thrown, but not a single shovel full of earth has been put over them and to this day[2] they are lying in that state, and the field covered with clothing, camp kettles, shot, shells, etc.

Some of our troops are at this moment actually marching for the plains of Albuera and we are in expectation of our route every instant, but the French are at too great a distance to be down there these three or four days. Come when they will, don't fear, we will give a good account of them, for the army is in good health and spirits and rages for the fight. Between ourselves, I am very sorry to say that a great number of our foreigners have deserted and given the enemy a vast deal of information, which they have already acted upon to our loss.

Having read this letter, my dear John, I daresay you will say "it is quite impossible to make out what this fellow means by his unconnected accounts." Your observation will be a correct one enough, but from the disconnected way in which it is written you will in some degree be able to judge how we are knocked about from pillar to post. If you can make out the writing, it is as much as I can do myself, for I have generally written when I have come in after a day's work, fagged to death, so you will, I am sure, make all excuses.

I hear you have kindly interested yourself about the brevet for me. It is a hard case, is it not? A captain in the army of the same standing would have got it.

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[1] Captain Robert Macdonald, (Kane's List, No. 858), commanding 'E' troop R.H.A.
[2] The battle was fought the May previous.

LETTER VII.

(To His Brother Robert).

Castello Branco, *May 5th, 1812.*

It is so long since you heard from me my dear little fellow that I suppose you have forgotten how to read my handwriting. I suppose by this time you have left your hiding-place, and by some chance or other you may think proper to give me a line.

I have been horse dealing as you will see by the enclosed. It is little "Dan" that appears on paper. I had very near done him, therefore I thought I had better let him go for £30 more than I gave for him. I daresay some of my friends would have been glad of the money last Christmas. I am afraid I may say "Johnny Raws'" eyes are gone, at least I fear a week or ten days will see them out. "Bobby" is in very high condition. I could get 100 guineas for him to-morrow, but he is too good to part with; the rest of my stud are all well.

We have been at this place for the last four days without the least idea when we are likely to move. I have not yet seen Bob Douglas, he is in advance with General Picton's division. All the time we were in the south the weather was intolerably hot. It was enough to melt the horses, but since our return to the north we have had almost constant rain, and it is as cold as in England in February. Great are the conjectures as to our summer campaign. Some say we are going back to the south, whilst others say we are going to Salamanca. It is certain that nothing can be done until his Lordship has thrown six months' supplies into Ciudad Rodrigo, which at present he is engaged in doing. Even after that I am very much afraid our division, (the 7th) will not be much employed, for we are composed of men of all nations, and when we are in advance they desert by dozens. We have had quite rest enough and the sooner the route comes the better.

Young Swabey[1] has left us to do duty with Lefebure's troop in the Alemtejo. Henry Baynes[2] has been spending the last two or three days with us. I hope you will soon see him in England, he has applied for leave, but has not yet received his answer. I think he is perfectly right, and I strongly recommended the step to him. I wish you would send me out by the next packet a foraging cap from Hawkes. Tell him to let it be much such another as Lieutenant Macdonald[3] of Ross's troop had of him a short time since. If Hawkes does not recollect, send me one "neat but not gaudy."

Our troop horses are now in very high condition, our forced march of twelve leagues to Llerena they performed without the least inconvenience to themselves.

What did you think of our firing at a brick wall ?[4] Considering it was the first time they had been in action I assure you the troop behaved remarkably well.

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[1] (Kane's List, No. 1327.)
[2] 2nd Captain Henry Baynes, (Kane's List, No. 1092).
[3] (Kane's List, No. 1174.)
[4] See entry in Swabey Diary, 26th of March, 1812.

What have you done this season in the way of hunting? How did old Mr. Hassard behave at the gates? This place is really so stupid I must close this for want of something to say. Harding[1] desires to be very particularly remembered to you and Charles.[2]

CASTEL BRANCO, *May 5th, 1812.*

[1] (Kane's List, No. 1322.)

[2] Charles Dyneley.

(*To be Continued.*)

OPTICAL INSTRUMENTS AND SILVERING GLASS SURFACES.

BY

DR. A. A. COMMON, LL.D., F.R.S.

(President Royal Astronomical Society.)

(A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 13th February, 1896.)

Colonel H. S. S. Watkin, C.B., R.A., in the Chair.

The Chairman—Let me introduce to you Dr. Common, President of the Royal Astronomical Society, whose work in connection with astronomy generally, and especially with one branch of it, stellar photography, is so well known, and who has kindly consented to give us a lecture on a subject which, I think, should be very interesting to us as gunners. From the time we are cadets to the time when we are full fledged gunners we have to deal with optical instruments of some kind or other—from the humble opera glass to the more complicated telescopic sights, range-finders, or position-finders, and I cannot help thinking that armed science will be greatly indebted to Dr. Common for his lecture this evening—(applause.)

Dr. Common—Colonel Watkin, ladies and gentlemen, the lecture which I propose to give you to-night divides itself into two heads, optical instruments and the silvering of glass mirrors. I will not stop at the present time to tell you how this title came about, but I feel that the first part of it is rather misleading. I meant to speak of a point that in my eyes is of great importance, that is, the care of optical instruments and the adjustment of them; but I found it was such a large subject to treat properly that I was very glad to find the title cut down to optical instruments only; and, that you may know what you may expect, I will just mention that all the optical instruments that I am going to speak about are three new ones which have lately not come out but been brought to the front, and which I wish to bring to your notice. One of them is certainly quite new, and the other two are, I think, equally new to many of you. As I have some experiments to make in order to show you better how the process of silvering is carried on in various ways, I shall proceed with that part first, with your permission. The silvering of mirrors has enabled a reflecting telescope to be made now of glass instead of speculum metal, and not

only has that been an immense improvement to the telescope itself but it has enabled us to use reflecting surfaces in other ways. For instance, we have now the equatorial coudé and the cœlostat—about which I wish to speak more particularly later on—both depending for their work upon accurate and strongly reflective plane surfaces; therefore to the astronomer particularly, the best silvered surface is a very important thing, and as it is quite an empirical process, I will show you the various results that are obtained by different processes. Liebig was the first to find out that aldehyde has the power of depositing the metallic silver from the oxide; and other men have worked on the same subject with more or less success until we have now got two or three excellent processes applicable to different ways of depositing the silver, hot or cold, upwards or downwards, which are sufficiently easy and practicable to be used by almost anyone. The first experiment I will show you will be the simple one of depositing silver from an ammoniated solution of the nitrate with tartaric acid; that, I think, is the simplest process that I know of. The next will be depositing silver from a solution of ammonia nitrate, using Rochelle salts. The next will be the sugar process, using not only ammonia nitrate but a mixture with potash in it, by means of which in the upward process of precipitation you get a very beautiful film. It will not take long to prepare these things, and while they are working out their duty I can speak of the optical instruments. The lecturer then proceeded to explain the different processes of silvering glass, dwelling particularly on the several points that require attention during the operation, such as the thorough cleaning of the surface, the use of a weak solution of protochloride of tin as a wash for the surface of the glass immediately before using the solution and the great importance of the sherry colour of the silver solution before the addition of the reducing agent—a practical demonstration of the various processes was given by silvering various glass vessels.

Now while these things are doing their duty in the best way they can—I do not know whether they will behave properly or not—I would just like to say a few words upon the other branch of the lecture. I have had occasion lately to read up the papers of an American astronomer to whom we have given the gold medal of the Royal Astronomical Society, Dr. Chandler. He some 12 or 14 years ago invented an instrument which he called the almucanter, which involves such an absolute departure from preconceived notions and has in its use proved such a remarkably good instrument that it is worthy of, you might almost call it, resuscitation, for it has been buried for many years now—nobody has ever made another that I have ever heard of, although the results which are given in the 17th volume of the annals of the Harvard College Observatory show its remarkably and wonderfully accurate measurements. In illustration of something else here, I have brought a little model—it is not a very complicated thing, but it is sufficient for the purpose. If we take this model as the polar axis that astronomical instruments like the equatorial are mounted on, and which by one rotation will carry any instrument fixed upon it round so as to follow the stars by one motion, we have an example of the

ordinary equatorial. If, however, in place of having the principal axis parallel to the axis of the earth we place it horizontally E. and W. and swing a telescope at right angles so as to describe a great circle through the pole, we get the ordinary transit circle, by which, up to quite recently, all the exact measurements which have given us the absolute places of the stars in the heavens have been taken. These instruments, one of which is supposed to be a necessary equipment of every large observatory, have been made heavier and heavier and stiffer and stiffer by way of eliminating flexure and some other troubles; but they have all a more or less inherent fault, the heavier you make an instrument the greater is the flexure and the more subject it is to fluctuations of temperature and the movements of the piers on which it is supported. The instrument, which Dr. Chandler has invented, differs most remarkably from the transit circle, when we consider that the object is the same, that is, to get the position of stars accurately defined—but the methods of working are widely different—instead of using a great circle determined by a horizontal axis on the earth, Dr. Chandler uses horizontal circles. He has a telescope not connected mechanically with the earth, but floating in a bath of mercury in such a way that if the telescope is pointed to any part of the sky and the whole turned round on the vertical axis, the telescope will sweep round on a small circle, whose centre is the zenith and thus any star can at the points of its intersection of this small circle be observed.

The mechanical arrangements were then explained. There is no absolute contact between the telescope floating and this lower part, nothing beyond a couple of pins to hold it in its position. Now any mechanically-minded man would think, of course, that this is a very unsteady arrangement and the slightest thing would upset it, and when it turns round there seems to be a chance that it will not come to the same position, but strangely enough, Dr. Chandler, who does not seem to have been labouring under the same fear of preconceived notions that most of us possibly would have been doing, put the thing to the proof, and he found as the result of experiment that the telescope absolutely pointed to some part of the small circle it originally pointed to when rotated in azimuth so accurately that there could not have been a deviation of one hundred thousandth of an inch between the ends of the float. The accuracy with which the thing comes back to its original position with regard to the centre of gravity seems incredible. I know that some years ago when I was devising a gravitational instrument (I wish Professor Boys was not here) for I hardly like to talk of his own subject, and thought of a means of measuring a slight attraction by having a floating ball with a circumferential motion, I gave it up because I thought that surface tension would affect it. I should rather like to ask Professor Boys what would happen if one has a ball floating in mercury, and on turning it the curves of the surface of the mercury when the ball cuts the surface vary. I have asked one or two people, but have not yet received a satisfactory answer. This is one form of instrument which, as I say, has been practically buried for the last 14 years. The first instrument which Dr. Chandler made

had a telescope about $1\frac{3}{4}$ inches aperture, and the last about 4 inches; and the results which are given in that same volume of the annals of Harward College Observatory are amazing in their accuracy. I am going to make an effort to resuscitate it, because I think it is capable of more accurate work than the instruments which are now used for practically the same purpose. There is another point about it. That is, the symmetry as regards the strain on any part; when the thing is rotated in azimuth, there is not the least additional strain anywhere; you cannot move any other instrument either equatorial or transit circle without inducing strain. There is no doubt there is a charm about this instrument, from the simplicity of its design, apart from the remarkable accuracy of the results obtainable.

The next instrument I wish to speak about is a modification of the equatorial telescope—where instead of having a telescope carried on a polar axis in the usual way—we make the polar axis hollow and by a plane mirror and the rays from an object glass carried on an arm, up the tube to the top to where the observer sits looking down into it. This is very like the coudé or bent telescope of M. Loewy, of Paris, but there is only one plane mirror, at Cambridge, where they were about to mount one of Cooke's new objectures in the ordinary way, I have, with the help of my friend, Professor Turner, of Oxford, induced the authorities of the observatory to try this plan so that we shall soon have a most important experiment put to the proof with, I hope, perfect success.

The next instrument is one that, I think, is practically one of the most important things that we have had in astronomy for a long time, that is, the cœlostat of M. Lüpman. It is not really Lüpman's, and it is not mine or anybody else's, but August's, who, in 1840, published an account of it. It is a thing that would have schemed itself sooner or later, because it is so obvious a thing when you come to consider it. It is simply a large plane mirror, mounted parallel to a polar axis which is rotated at half the rate of the earth's rotation, that is, rotated once in 48 hours, and it has this property that any part of the sky which you can see reflected in it can always be seen, and unlike the siderostat, the image does not rotate; so that you can set this mirror to any part of the sky within limits; you can put your telescope on it and set the clock going, and the object remains perfectly steady, the only thing that is moving is the cœlostat. It is a fixed heavens to all intents and purposes. For eclipse work this is an ideal instrument. As the sun never departs many degrees from the equator, the conditions never become unfavourable geometrically. The observing telescope can be fixed firmly, as it need not move for any one declination. In the case of solar eclipses, the usual plan has been to take equatorial telescopes with their domes or houses which are cumbersome and heavy, and in many cases very difficult to transport to the required site. The use of the cœlostat will greatly reduce this cost and labour. We have had four of these new instruments made for observing the next total solar eclipse in August next, two of these go to Japan and two to Norway, where I hope to go and to have the pleasure of at least one officer Royal Artillery as an aid in observing with one of these

instruments. I am sure it would have been a great blessing to many previous observers, where the difficulty of getting sufficient accommodation in the way of huts, in heavy rains especially, was sometimes very great. I do not know whether everyone understands the principle of the instrument, but if not I shall be very pleased to explain it further. I consider it is one of the most useful instruments for a certain kind of work; even in a fixed observatory, if a man has a branch of work that lies in a certain zone, he can practically fix his telescope and go on making observations night after night with the certainty that he is working under the most favourable conditions possible. I think that these three instruments, which I have brought to your notice, and more particularly this cœlostat, are tremendously great advances in the way of astronomical instruments. I think the last certainly has a great future before it, because there are so many classes of work that it is capable of doing; and, as I say, for eclipse work it is simply admirable.

To return to the silvering:—None of these solutions are working quite as I should like them, but that as you know is generally the way. This mirror has not a thick deposit of nitrate upon it, though it is a very fine illustration of the coating that it is necessary to put on to an object glass or otherwise to reduce the glare of the sun, it is not a specimen of the film one ought to have on an astronomical mirror or plane. The solutions in this bottle are not working very satisfactorily. This long tube, however, is much better and shews what can be done fairly well. Like all empirical processes, it is not a certain one, but as a rule when you have done it a few times you can get absolute success. I have given an appendix with a few notes written some time ago about silvering, together with an additional note, from which any one can with a little care be sure of success.

I should like to say a few words about the eclipse, which I referred to just now, in case anybody should care to take the opportunity, which will be given by this eclipse, and not again for many years to those living in England, to take a short sea trip and see it. The eclipse begins just to the north-east of Scotland, at sunrise, and the further you get east the higher the sun will be up. It will be well seen at Bödo, which as you know is on the west side of Norway and not very far up the coast beyond Trondhjem; this no doubt would be a very charming trip. I had occasion to go to Bödo some five or six years ago and I cannot imagine a more delightful sail, especially to bad sailors, (for there is no doubt that some people's pleasure is very much sacrificed in that way when they suffer from sea-sickness), as once across the German ocean, the steamers go up what is called the inner lead among the little islands that stretch along the west side of Norway. The eclipse will be visible from just a little south of Bödo and at other points on the west coast, but not under the best conditions, as the sun is not very high, only some 7° or 8°, but still, except for scientific work, sufficiently high to enable a good run; and as many of us have never seen a total solar eclipse and never will again, it is an opportunity not to be lost sight of. By going round the North Cape and passing into the Varanger Fiord, as I am going (and

I hope Major McMahon, who has kindly offered to help me as an observer also), we may see the thing under much more favourable circumstances. We cannot expect that we will be so favoured as those at Japan, where the sun will have an altitude of about 45° and where the duration of the eclipse will be a little longer; but it is a long way to go to Japan. It is a most delightful thing to think about, even if one cannot go, going to Japan and with an eclipse thrown in. Of course, a solar eclipse to different minds has a different value, but to anybody it must be a most wonderful thing to see, and I should think it was well worthy of even such a long journey. But the journey to Norway is only such a one as many people take just for mere pleasure just at that time of the year. (Applause).

DISCUSSION.

The Chairman—By way of starting a discussion I should like to ask Dr. Common one or two questions with regard to silvered mirrors. I have to deal to a considerable extent in mirrors for range-finders and I find a great deal of difference in the light reflected from different mirrors by different makers. In the first place the mercurial silvering seems to me to be brighter than the deposited silver, I do not know whether Dr. Common can give us any experience with regard to that. Then again, I find that the deposited silver is different from different makers, that the image is more distinct with some than with others. When I have been observing on a dull day I have found a distinct difference between two sets of deposited silver glasses; and the question is, whether the system of depositing is answerable for this difference, or has it something to do with the want of cleanliness in the glass before the silver is deposited. I suppose that to some extent the value of the reflecting surface varies according to the method employed for depositing the silver.

Then again, Dr. Common can perhaps tell us how to test mirrors as to their quality of reflection—whether there is any way of comparing one mirror with another. We often find a difficulty when inspecting mirrors to say whether they are up to the standard in quality, as so much depends on the state of the atmosphere at the time of testing. With regard to the cœlostat, would not the fact of having to observe by the aid of a large mirror of large surface, which it must be difficult to obtain perfectly true, rather detract from the value of that instrument.

Professor C. V. Boys, F.R.S. (Applause)—Mr. Chairman and Gentlemen, when I heard that Dr. Common was going to lecture to you upon the subject of the silvering of mirrors and the care of optical instruments I was exceedingly anxious to be able to have leisure to come and hear him, because I, myself, have for many years been but an amateur in matters astronomical and have experienced some of the difficulties which we have had examples of this afternoon, of silvering mirrors satisfactorily. I remember not very long ago, in conversation with Dr. Common on this very subject of silvering mirrors, that he incidentally mentioned the use of the protochloride of tin. It was not generally known at that time; it certainly is not given in any text-book that I have read; and I need hardly say it was absolutely new to me. In consequence, directly I got back to Kensington I caused some mirrors that were going to be silvered to be splashed—not properly dipped in but just splashed with a little protochloride of tin solution—and to be carelessly washed off; the effect was most marked and beautiful; every little mark of the chloride of tin solution, every place on which it had been splashed shewed itself at once in the silvering, producing a denser, thicker and more uniform deposit. And now in consequence of this information obtained in this accidental

way the use of protochloride of tin is, at our place at any rate, universal; it ought to be universal everywhere, because it facilitates the process so enormously. I wish Dr. Common could explain it by some more satisfactory term than that of catalytic action, a term which is generally used to hide ones defective knowledge.

With respect to that very beautiful instrument of Dr. Chandler's, I must say I was quite as surprised as I ought to have been when I heard of the extraordinary precision with which such a telescope would point, when removed from any particular position, round a vertical axis and brought back again; certainly one would not have expected that a telescope would recover its position with an accuracy which corresponds to the optical defining power of an instrument even so small as two inches aperture or thereabouts.

Dr. Common was good enough to put to me a question that I could not properly catch, because owing to the brilliance of the light and the reflective power of the blackboard (which is something like a silvered mirror, being dark and shiny) I was quite unable to see a single mark that he made upon it. I do not know whether the marks are there now, but I cannot answer the question because I do not know what it was.

Dr. Common—They are rubbed off now.

Professor Boys—I should also like to know exactly what the observation is that is made. Is it taking the time at which a star passes this circle on the east and then passes this circle on the west?

Dr. Common—Yes.

Professor Boys—Very well. With regards to the coelostat that again is an instrument which was certainly new to me when I read about it last year I think. The instrument is one that I should like to have had very much when about six or seven years ago I was experimenting on the heat radiated by the stars; I believe in lecturing on quartz fibres in this Institution a year or two back, I gave some short account of those experiments. The difficulty there was to mount a large telescope—I had a 16-inch mirror lent me by Dr. Huggins—so as always to bring the light from the star to one point in space, and always to bring it horizontally to that point, because that was the point at which the sensitive surface of the radio-micrometer was placed, and the instrument is of such a kind that it cannot be pointed about as it would have to be if it were attached to an equatorial telescope. So I designed a special instrument, and again I took advantage of Dr. Common's great practical knowledge in submitting my designs to him before they were sent to the engineer to be executed, and I got some very valuable suggestions. Among others I remember perfectly well the exact words he used—I made a drawing of the suggested instrument and was a little alarmed as to whether the iron-founder would succeed in making the somewhat complicated form; I did not quite see how to cast it myself; and he comforted me by saying, "They can cast anything." Well, they did cast it all right, and I did not make a more elaborate pattern than I should naturally have done. This cœlostat would not have had, for my purposes, the particular advantages that it possesses from the point of view of eclipse observation or photography of a portion of the sky, namely, that it not only brings some particular star into a definite position as seen in the telescope and keeps it there quiet, so that it or its spectrum may be quietly examined, but it keeps that star and the neighbouring stars in the same relative position. In the heliostat you see the star or the sun all right in the telescope, but as time goes on the object turns round about the axis of the telescope as a centre. If the object is to be photographed, especially if the exposure is long, the cœlostat is necessary, as the image is prevented from turning round, you see it stationary so that two stars one above the other will always remain so, and not turn head over heels as they would do if seen with a heliostat. The remarks that your chairman has made on the possible objection owing to the fact that there is another surface, are exceedingly pertinent,

because the difficulty of producing a large plane surface which must be plane in an extraordinary degree, even more perfect as a plane than the mirror is as a parabola—the difficulty of producing such a surface is exceedingly great. It is true that Dr. Common is himself a master in the art of producing spherical parabolic and plane surfaces, and perhaps he has not thought it worth while to mention that it is not so easy a thing to make a truly plane surface; in fact until Lord Rayleigh a year or two ago invented a new process there was no method by which one could with extreme accuracy test not only whether a thing was a plane but see exactly how much it was in error in every part using a quarter wave of light or the one hundred and sixty thousandths of an inch as the unit of observation. Of course now one cannot explain the process invented by Lord Rayleigh, but I will simply say that Lord Rayleigh has done for optical workers working on plane reflecting surfaces exactly what Sir Joseph Whitworth did for mechanical engineers. Before Sir Joseph Whitworth's time pieces of iron were ground and rubbed together until it was imagined that they would both be flat, which neither of them could be; his process of scraping and the creation of surface plates has made a revolution in the possibilities of mechanical engineering. And I believe in the same way the process of Lord Rayleigh will do precisely the same thing where not merely comparatively small surfaces are concerned, but where these very large plane mirrors which will be required when any such method as this is used are necessary in order to enable a large telescope to be used. I feel that if these large mirrors can be made fairly easily and fairly cheaply and still with this enormous degree of accuracy which is essential, then there will be a great advantage from instruments of this sort. Had I been able to get any such mirrors when I was making my experiments on the heat of stars I should have been only too glad to have been able to keep my telescope quiet and still in a horizontal position, instead of having to employ a telescope wandering about in all directions and get so mounted that wherever it was pointing it would bring the light from the star horizontally to one fixed point. (Applause).

Captain M. B. Lloyd, R.A.—There is one point I should like to ask Dr. Common about, and that is with regard to silver reflecting surfaces. The reflected light from silver is slightly red in colour, and I would ask whether that makes any difference with regard to spectroscopic action and stellar photography. Palladium gives a very white reflection, and I want to know whether it has been applied at all to mirror silvering or mirror plating.

REPLY.

Dr. Common—With regard to the question put by the last speaker, I have made no experiments on the reflecting power of palladium, but I know that it can be deposited, and possibly it may be a very useful metal to use. Of course anything deposited on a mirror which is of the shape of the ultimate metal assumed can be taken off and tried again. The form is given by the glass mirror and the film which is then deposited converts that glass mirror into a metal one—the same metal as the film. So that with a good glass surface it is possible to try all these various experiments and determine absolutely the effect. With regard to absorption of the blue rays there is no doubt a slight absorption by the silver; but considering the efficacy of silver on glass telescopes in phographing the most delicate objects in the heavens (that is the nebulæ) we cannot say that it is very deficient in actinic power. In fact, up to now it has exceeded the achromatic; but for some reasons it does not give the same delicate points with stars; there is more diffusion of light in the reflecting than in the refracting. I have no doubt that it may be quite possible that we may get a metal which will give us a whiter image than silver. I have noticed the red colour in using speculum metal, but I have never noticed that with the silver on glass.

That brings me to a point which your chairman brought forward, and that is the reflective power of the various films. There is no doubt an enormous difference; it is a matter that I have been working at—I was working at it many years ago—and for the purpose of determining the comparative reflective power, especially photographically, I had some sort of arrangement like this—I must put it so that Professor Boys can see it, and I daresay somebody else will too. I had up *here* a point of light to focus the object glass, and there would be, about parallel, a beam of light *(describing the same on the blackboard)*. *There* was the wall of my dark photographing room; *this* was the beam of light that would practically go on with very slight variations, because the hole was a very minute one. I took two pencils of that light from equal distances of the object glass and that made two square pencils of light that I could do with as I liked. I put on various pieces of glass silvered in various ways and had the reflection at different angles. I could send on to the photographic plate the two beams from tho different reflectors, and I found there was an enormous difference; there was a difference after the silver had been exposed to the air and when it was first polished, and there was a difference between speculum metal and silver. It was a very interesting series of experiments that I made, but I did not conclude them; they were in the hands of my assistant at the time and I left the matter to him principally and he did not complete them. We would find that there was an enormous difference, which we could make quite evident, either with the length of exposure to get the comparable images or with the difference of density when the same exposure was given to two different reflecting surfaces; it would at any time be easy to substitute a photometer for the photographic plate and thus determine the loss of light for visual work.

The Chairman—It is the slight differences that are so difficult to detect.

Dr. Common—You must magnify them. The eye density and the photographic density are comparable I believe. I find with the source of light of different colours the density varies in fair proportion with the light as seen, and I think you would get some sort of a guide at anyrate.

With regard to the cœlostat and the image there is only one surface, and the coudé telescope of M. Loewy has two surfaces; that answers very well indeed. When some years ago I saw through it the images were very fine; I have never seen through the larger coudé lately finished, but I have seen a photograph which shows the details on the surface of the moon and indicates that the definition is actually superb. There we have two surfaces and the length of the reflective ray is very long, so that the linear dispersion from an irregular surface would be very large, and we may consider the plane mirror question at an end. No doubt when the coudé was first made everyone thought that the plane mirrors would be no difficulty, but the brothers Henry of Paris are capable opticians and make beautiful flats. I have one of theirs which they gave me before I took to flat working myself, and I am now fortunately just in a position to criticise their work and no more.

With regard to what Professor Boys said about the protochloride of tin, I am very glad to have his testimony to the efficacy of the tin solution. It is one of those little things which help to make a person successful, it was told me by a gentlemen who had I think to pay for the information, but I had already had a search made in the Patent Office and found this mentioned, so I have no scruple in mentioning it again.

The Chairman—Gentlemen, I have nothing further to add but to express our thanks to Dr. Common for his very interesting and instructive lecture. I hope it will not be the last that he will give us, and I may suggest that the care and preservation of optical instruments would be a very interesting subject for another discourse. (Applause).

APPENDIX.

SILVERING GLASS MIRRORS.

The importance of a good reflecting surface in such instruments as the modern silver-on-glass reflecting telescope and the equatorial coudé is obvious. As a rule the silver surface if fairly protected from dust and damp will last many years with but slight loss of light, but must be renewed frequently if the best results are to be obtained. Many different processes and methods of silvering have been from time to time published by different people, and it becomes of some interest to examine these with a view of finding out the particular one that suits certain cases.

Having used reflecting telescopes for many years I have had occasion to try a great number of experiments with a view of getting a good process. It would be tedious to give these in detail, but it may be useful to give some few instances where satisfactory results have been obtained.

The process of depositing the metallic silver on a glass surface is an empirical one; the conditions affecting the reactions are so various that hard-and-fast rules cannot be laid down. The temperature in which the process is carried on seems perhaps the most important thing to be considered, ranging as it may from 35° or 40° to 104° F. according to the reducing agent employed.

I have had occasion to look up the processes published from time to time; some of these are of sufficient interest to be given briefly.

Baron Liebig found in 1835 that on heating aldehyde with an ammoniacal solution of nitrate of silver in a glass vessel a brilliant deposit of metallic silver was deposited on the surface of the glass. To this observation is due the modern process of silvering glass.

The next important step seems to have been taken by Cimeg, who, in 1861, patented a process for silvering mirrors (where of course only the surface against the glass is used) by what has since been known as the Rochelle-salt process. The patent is No. 619, 1861. After cleaning the glass in the usual way he washes the surface with Rochelle-salt solution 1 in 200. For 1 square yard of glass he takes 20 grammes of nitrate of silver in solution and adding it to ammonia of commerce till a brown precipitate commences to be produced; to this is added a solution of 14 grammes of Rochelle salts. Using the mixture in this proportion when it becomes turbid he pours it over the glass plate, which has an inclination of 1 in 40, for 30 minutes at a temperature of 68°.

In 1862 Cimeg has another process patented (No. 2314). He uses 20 grammes of Rochelle salts in 300 grammes of water, 20 grammes of nitrate of silver in 15 grammes of water with ammonia to clear; but in place of using a weak solution of Rochelle salts on the surface of the glass before silvering he rubs on the juice of apples, currants, sorbs, or other berries before silvering.

In 1873 Woerther uses glucose as the reducing agent.

In 1876 Pratt patents a process (No. 1259) in which before silvering he treats the glass with 1 part of protochloride of tin in 100 parts of water. For large plates he uses 1 part of protochloride of tin, 3 drachms of oxalate of ammonia, ½ lb. putty powder, 4 pints of distilled water; this is rubbed on and allowed to dry; he then uses a solution of 2 parts oxalate of ammonia, 4 parts grape-sugar, 1 part lime, 1 part potassic cyanide, in 1000 parts water. In silvering he uses tartaric acid, but does not give details.

There are a few more patents for silvering since the last date of no importance.

In 1881 Piazzi Smith gives, in "British Journal of Photography Almanac," Martin's process in full. This is a pretty well-known process, and in some hands

has worked very well. Many other processes, in which the chief variation is the reducing agent employed, have from time to time appeared in the various scientific journals—the most important being that published by Mr. J. A. Brashear in the "English Mechanic," vol. 31, p. 327. This is a most excellent process and for ordinary work, when the glass can be put in face downwards, the best I know. This I give further on as I use it.

In the "Encyclopædia Britannic," vol. 16, p. 500, two processes, hot and cold, are given; these, though mainly relating to the silvering of ordinary looking-glasses, have a bearing on the process as used for silvering mirrors.

"In the former method there is employed a horizontal double-bottomed metallic table which is heated with steam from 35° to 40° C. The glass to be silvered is cleaned thoroughly with wet whiting, then washed with distilled water and prepared for the silver with a sensitizing solution of tin, which is well rinsed off before it is removed to the silvering table. The table being raised to the proper temperature the glass is laid and the silvering solution at once poured over it. before the heat of the table has time to dry any part of the surface of the glass. The solution used is prepared as follows :—In half a litre of distilled water 100 grammes of nitrate of silver are dissolved; to this is added of liquid ammonia (sp. gr. 0·880) 62 grammes; the mixture is filtered and made up to 8 litres with distilled water, and 7·5 grammes of tartaric acid dissolved in 30 grammes of water are mixed with the solution: about 2·5 litres are poured over the glass for each superficial metre to be silvered. The metal immediately begins to deposit on the glass, which is maintained at about 40° C. (104° F.), and in little more than half an hour a continuous coating of silver is formed. The surface of silver is then cleaned by very carefully wiping with a very soft chamois leather and treated a second time with a solution like the first, but containing a double quantity of tartaric acid. The solution is applied in two portions, and thereafter the glass is once more carefully cleaned of all unattached silver and refuse and removed to a side room for backing up."

"In silvering by the cold process advantage is taken of the power of inverted sugar to reduce the nitrate of silver. This process has been adopted for the silvering of mirrors of astronomical telescopes, notably of Leverrier's great telescope in the Paris Observatory. For ordinary mirror silvering the following is the process recommended by H. E. Benrath :—Two solutions are prepared, the first of which contains the silver salt, the second the sugar preparation. For the silver solution 800 grammes of nitrate of silver and 1200 grammes of nitrate of ammonium are dissolved in 10 litres of water and 1·3 kilos of pure caustic soda in 10 litres of water, and of each of these solutions 1 litre is added to 8 litres of water, which is allowed to rest till the sediment forms and then decanted. The second solution—inverted sugar—is prepared by dissolving 150 grammes of loaf-sugar with 15 grammes of vinegar in 0·5 litre of water, and boiling the solution for half an hour. After cooling it is made up with water to 4200 cubic centimetres. The silvering is done on horizontal tables in a well-lighted and moderately heated apartment, and the glass is cleaned with scrupulous care. For each square centimetre of glass operated on 15 cubic centimetres of the silver solution above described are measured out, and from 7 to 10 per cent. of the solution of inverted sugar is added, both being quickly stirred together and poured rapidly and evenly over the glass. The reduction immediately begins and the solution exhibits tints passing through rose, violet, and black, till in about seven minutes it again becomes transparent and the deposit of metal is complete. This first deposit is extremely thin and allows the transmission of bluish rays. The exhausted solution with floating and unattached dust-like particles of silver is carefully wiped off, the silvered surface washed with distilled water, and again treated with the mixed solutions to the extent of half the quantity used in the

first application. The finished surface is wiped and washed in the most thorough manner—for the least trace of caustic soda left would destroy the mirror. The further processes are the same in both methods of silvering."

In Brashear's process, already mentioned, the most important thing is the sugar solution forming the reducing agent. This greatly improves by keeping—a solution that has been made some months being much more effective than a newly-made one. I find it convenient to have always some Winchester quarts of it in stock ready for use. I have for convenience varied his proportions slightly and thus give them as I have found them work so well. For the sugar solution I add to a 10% solution of loaf-sugar, in distilled water, 10% of alcohol and ½% of nitric acid. Solutions of 10% of nitrate of silver and of caustic potash are separately prepared, the latter one as wanted. These, with sufficient ammonia and a very dilute solution of nitrate of silver, and also a similar very dilute one of ammonia, are prepared, the latter in order to obtain that pale brown colour of the ammoniated solution of nitrate of silver that it is absolutely necessary to have before adding the reducing agent.

Having selected a suitable dish to contain the liquid, in which the mirror can be placed face downwards with about ½ or ¾ inch of liquid underneath, find on the basis of 1 of silver-nitrate solution to 4 of the total required liquid the amount of silver solution needed; to this add ammonia till the first formed precipitate is dissolved, then add one half of this quantity of the potash solution (this is a variation from Mr. Brashear's formula that I have found works well), and again add ammonia till the mixed solution is quite clear, taking care to put in only sufficient ammonia for that purpose; then add the weak solution of nitrate of silver till a clear brown colour is obtained; should this become a dark brown some of the weak solution of ammonia will bring it to a pale brown colour, which must persist if the solution is left standing some time.

The mirror, previously cleaned with nitric acid and distilled water, and suspended in the dish in distilled water of sufficient amount to make up on the addition of the solutions the total liquid required, is lifted out and the prepared solutions mixed with the distilled water and an amount of the reducing solution equal to about one half that of the nitrate of silver solution more or less as the temperature is under or over 60°; as soon as all is intimately mixed the mirror is immersed with one movement, beginning by dipping the edge first and lowering so as to prevent any air-bubbles forming under the glass. In from three to five minutes the silver begins to form on the mirror, the solution changing from pink to dark brown and black, the film thickens quickly, and in from twenty-five to thirty minutes sufficient silver is deposited. The mirror can then be washed and put to soak in distilled water for a few hours, then taken out and dried and polished in the usual way, that is, with a soft pad af clean chamois, and going all over the mirror with light strokes till the bloom is all removed and a fair polish is obtained, finishing with a very little of the finest washed rouge, quite dry, lightly dusted on the pad; it is very important to well consolidate the film of silver by the unrouged pad before using any polishing-powder.

It is a very good plan for any one who is not in the habit of silvering, or to whom the process is strange, to try the proportions of the solutions on some small pieces of glass till a satisfactory proportion for the temperature (for that is the chief factor in varying the amount of reducing solution necessary) of the room in which he is working. The most important thing (after the solutions) is the proper cleansing of the glass, for on the proper preparation of the surface of the glass a very great deal depends.

As already stated, this process is used when the glass to be silvered can be suspended in the liquid; it is not suitable when we attempt to silver surfaces face upwards. The mud formed settles down and prevents any proper deposition of

silver; this was a source of considerable trouble when it was required to silver the three-foot mirror, and a pneumatic arrangement was eventually made to hold the mirror by the back, so that it could be silvered face downwards, and up to that size the silvering could be managed.

The great size of the five-foot mirror and its enormous weight (over half a ton without the cell) made it dangerous to suspend it, and the question of silvering became a serious one. In making experiments in order to get rid of the mud formed in the process last mentioned, it was found that by leaving out the potash the silver was deposited from a nearly clear liquid and no mud was formed, and the first five-foot mirror was very successfully silvered in this manner. The solutions of silver and sugar are used in the same proportions without potash, but it is found advisable to use a stronger total mixture. For subsequent silvering of the five-foot mirror the Rochelle-salt process has been used, and this for the deposition of the silver on a surface face up seems to be the best, using, if necessary, two or more applications.

In preparing a large mirror for silvering in this manner it is necessary to form it into a dish by using a band of paraffined brown paper round the edge, standing up an inch or more all round, and mounting the mirror on a swinging support, so that it can be tipped up to throw off the water or spent solutions; in the case of the five-foot mirror, when mounted on the machine, this tipping up could be done by the same arrangement used for placing the mirror vertical for testing.

The proportions of solutions used for the five-foot were for each application: 3000 cubic centimetres of silver solution as before ammoniated as already described and 500 cubic centimetres of Rochelle-salt solution, with about 29,000 cubic centimetres of distilled water; this remained on the mirror 28 minutes; another similar application was left on for 30 minutes; after thorough washing, distilled water was left on for some hours and the film dried and polished.

A very fine film of silver was deposited on a five-foot mirror, using one application only of 4000 cubic centimetres of silver solution and 750 cubic centimetres of Rochelle-salt solution: this after one year was found to be in a very good state indeed; this was on the first mirror which, from some defect in the glass, could not be made into a good mirror. The disk of glass was returned to the makers to be replaced by another. I took this opportunity of removing and collecting the whole of the silver by dissolving it in nitric acid. The assay of the deposit gave a total weight of 26·5 grains of silver on a surface of 2800 square inches, equal to a thickness of $\frac{1}{28,000}$ inch, almost exactly; in actual weight somewhere between that of a threepenny and fourpenny piece, not a large amount of the 400 grammes of nitrate of silver used in depositing the film. The actual waste need not be very much, as the chloride of silver can be easily deposited by the addition of common salt to the spent solutions and the silver thus recovered.

It will be seen that the various processes all have the ammoniated solution of nitrate of silver, and differ only in the reducing agent. The preparation of this solution, in order to get the pale brown colour already spoken of, demands some care. If the solution is too strong, on the addition of ammonia a very flocculent deposit is formed, difficult of redissolution. If after the solution is cleared by the addition of ammonia a strong solution of silver nitrate is added to get this colour, this flocculent deposit occurs; but if the weak solution advised be used, there is not any difficulty in getting the proper colour free from any deposit. This is important. A word of caution may not be out of place concerning the production sometimes of a fulminate of silver, recognized by its dark-grey metallic lustre. This is extremely liable to explode with great violence on the contact of almost any thing; a few drops of water once sufficed to explode some in a beaker and blow it to fragments. By using moderately diluted solutions this

danger is obviated. My own experience is not singular in this respect, for Mr. Brashear relates a similar occurrence.

The silver film is not always of the same quality, and experiments are needed to get more information as to what determines the greater density and coherence of some films over others. I have had surfaces of glass silvered experimentally where the film would not wash off with any amount of wet rubbing, these mostly on surfaces that had been silvered many times. Probably the glass in this case was in the best state to receive the new deposit; certainly the condition of the surface does affect the coherence of the silver as well as the amount of the deposit, as judged by the way in which certain parts on a mirror that has been incompletely cleaned show that the deposition has begun long before other parts, necessarily resulting in an unequal thickness of film. With the most careful cleaning of a mirror I have often found that the first application did not succeed, but the second on the surface just cleaned off with nitric acid was all right. The nature of the liquid other than distilled water last in contact with the surface of the mirror seems to be the determining thing.

Many variatians of the sugar process have been used and each man has his own particular formula. Mr. F. G. O. Wadsworth gives in the "Astrophysical Journal" for March, 1895, an article on silvering, in which there are several interesting points, he gives a slight modification for the reducing agent and a table of quantities to be used for different sized mirrors which it is not necessary to introduce as it is on the basis of 120 grains nitrate of silver, 60 grains of potash and about one and a half ounces of reducing solution for an $8\frac{1}{2}$ inch mirror. Ammonia being used as required—he mentions the method of supporting the mirror by a suction pad which I successfully used some 13 years ago with a three-foot mirror.

MESS MANAGEMENT.

BY

MAJOR J. HOTHAM, R.H.A.,

AN OLD MESS SECRETARY.

As the comfort of officers depends a great deal on the Mess, and as also the credit of a regiment or battery depends in a way on the good management of the same, I have endeavoured to jot down a few hints on the subject that may be of use to some officers who willingly and often unwillingly have to undertake the offices of Mess Secretary and Mess President, both very thankless tasks and no sinecures at all, especially the post of Mess Secretary.

Mess Secretary. Thankless task.

A Mess Secretary can get but little credit by working hard for the comfort of all his brother officers, however well regulated and comfortable the Mess may be; but he often has to put up with a lot of chaff and sometimes hasty and unpleasant remarks should anything go wrong—especially from the younger and more thoughtless members of the Mess.

For this reason I think, that if possible in a Regimental Mess, the Mess Secretary should hold the rank of Captain or, at least, be a very senior Subaltern.

Much has been written in newspapers on the subject of Mess expenses. A Mess should be managed to admit of the men with the smallest means living comfortably, especially as regards the messing. It depends of course entirely on members themselves as to what their bills amount to through wines, cigars and other extras. Personally, of the many officers I have known to go under from debt during my service, I cannot remember one ruined by his Mess bill.

Mess expenses.

As to whether a day's messing costs 4s. 6d. or 5s. makes but little difference really, only 15s. a month.

The expenses of keeping up the Mess crockery, furniture, linen, etc. may come to three or four shillings a-day above the regular Mess subscription, for it is not fair on those who drink wine that all the extra Mess maintenance charges should fall on them; still no one grudges these few shillings a month provided the Mess premises are comfortable and bright, as they should be under good management. It is noticeable, however, that the best regiments as a rule have not expensive Messes, for in good regiments there is sure to be fairly good Mess management and a good system; a Mess being good or bad really chiefly depends on the C.O. of the corps; if he means to have a good Mess he places a man in charge on whom he can rely to see to the good management of it, especially if he himself be a dining member.

The Mess Secretary.

The officer who is chosen or who elects to serve in this capacity and to carry through this thankless task must—to do it well—go heart and soul into the business; some officers have a taste for Mess management and cooking, and lucky indeed is the regiment or battery that contains such an officer.

The Secretary must see to every detail himself, at least until he has established a thorough system; I do not mean only to attend to the accounts, which latter, though very important, are not the chief duties of the Mess Secretary, though many appear to think so; and many faults will be noticeable in a Mess in which the Secretary makes all other details subservient to his accounts: the dinners will be bad, the wine will be hot, the silver dirty and the napkins unironed. Let the Secretary however once establish a good system of supervision over the messman (should there be one), the servants, the cook, the tradesmen, the kitchen and the pantry, then the work will soon become easy and his Mess a credit. As in every other business, half the battle is a good system.

Accounts not the chief duties of the Mess Secretary.

The cook.

Kitchen.

The Secretary should see the cook daily.

Cold joints.

Keeping down the butcher's book.

Dis-appearance of cold joints

See the butcher's meat daily.

Tender meat.

The Mess Secretary should personally see the cook and order all meals daily; it is also advisable to order two days' dinners ahead so as to give your cook time. I used in a small Mess to order seven dinners ahead on Saturday, or rather the outlines of them, on account of hanging the meat. Even if there be a messman, the Secretary should see the cook with the messman when ordering dinner, for orders received second-hand are seldom correct and certainly do not answer with cooks; also, the cook personally prefers to see the Secretary and likes to be taken notice of: when seeing the cook the Mess Secretary should look round the kitchen and larder and see that every thing is nice and clean, he should see the meat that has come in, also the vegetables, fruit and stores, and if it be a catering Mess, he ought to look round the cold joints and arrange what can be done for luncheon with them; half the messing expenses can be saved by a careful watch being kept on cold joints and by seeing that they are not wasted, but used up in hashes, minces, rissoles or stews. The butcher's bill is by far the heaviest item in the catering account, and it is in this item that most saving can be made, for if not carefully watched the bill will swell from month to month, especially with a bad or a dishonest cook, the former wastes the cold meat and has no ideas for luncheons, beyond fresh chops and steaks; the latter will take the cold joints away wholesale and piecemeal to feed her or his friends.

Should the Mess be run by a messman, it is not so necessary of course to see the cold meat, but it is more important than ever to see the fresh meat and supplies: bad messmen—and there are many—will invariably try to palm off second-class meat, stale vegetables and American bacon.

The Secretary should, even if he does not order dinners two or three days ahead, roughly make an estimate of the meat wanted for the next ten days in England and during the cold seasons abroad, so as to have the joints hung and the meat tender a *sine quâ non* if the food is to be appreciated.

A very slight study of a good cookery book (Mrs. Marshall's) when

ordering dinners and luncheons will enable him, with the aid of the cook, to arrange variety and change.

Unless he shows an interest in this, the cook will soon find this out and cook what suits her best if a woman, and what gives least trouble if a man; it is here where the economy of a good cook comes in, the plain (generally bad) cook, at say £30 a-year, as a rule can only roast and boil and make what are called plain soups, generally greasy and never clear, his or her cutlets are bad chops covered with bread crumbs, the hashes shine in grease and her only *entrée* is a beef olive (an abomination). The plain cook invariably suggests fresh joints and big ones for every meal, they are simpler and suit the butcher better. Your plain cook has no ideas on the subject of made dishes and does not care about the trouble of learning. It is by far cheaper to pay £10 to £15 a-year more in wages and get a real cook, who can make soups and thoroughly understand *entrées* and made dishes; in fact, who knows how to send up a small dinner without ordering 20lbs. of beef. A good cook can always make up luncheon and breakfast dishes from cold game, chickens and bones, which the bad or plain cook would very likely throw away, and the saving in the butcher's bill in two months will be found to be nearly equivalent to the extra wages of the cook for twelve months.

Economy of a good cook.

Plain cook.

When cooks, whether they be men or women, see that the Mess Secretary and the commanding officer interest themselves in their work, they will naturally take more trouble to please.

The kitchen should be made thoroughly comfortable and clean and the utensils should be kept quite up to date. As a rule the condition of the utensils in Mess kitchens is not creditable; the cook should be made comfortable and there should be a good easy chair or two in the kitchen, a nice table and a few flower-pots in the window.

The kitchen to be comfortable.

In a large Mess an assistant cook will be wanted, in a small Mess a soldier assistant does very well; a clean smart man should be selected of a certain age, who does not go out much, and who has had, if possible, a term in the regimental cook-house, it is an easy billet and many old soldiers take to it readily.

Assistant cook.

To find a good ready-made butler in a regiment or a battery is rare, although there may be some waiters by trade; the post is a responsible one and has a good many temptations.

The butler.

If there be no butler already in the Mess, it is best to take a smart, steady, old soldier and teach him; with a week or two's trouble a quick man may soon pick up the work; a few lessons on waiting can be given and one or two of the officer's servants are sure to know something of the work and will help him; for the first few days the Secretary must devote his time and attention to his instruction and must put him right fifty times a day in small details of waiting, standing, handing dishes, decanters and glasses.

Instructions in waiting.

The Aldershot and Woolwich Messes will sometimes send a man already trained to out-stations if application be made.

The butler must be a reliable man and one who does not drink or want to go out much; the work is not hard when he gets into the way

Butler should be given a stripe.

and becomes master of it; he should be given a stripe to give him authority in the Mess over the officers' servants, for these latter unless sharply wheeled into line at times are much inclined to scamp their Mess duties. In a regimental Mess, where there are two or three Mess servants, some one or other of them is learning the work and can always go on detachment and take up butler's duties; in small Messes, however, there is more difficulty.

Soldiers pick up cleaning silver very quickly and generally do it well.

Dress of Servants.

Cleanliness and tidiness of servants, especially in their dress, and they should never be allowed to come into the Mess or ante-rooms in slovenly kits; they should all be provided with two or three clean striped linen or nankin jackets for morning work and to wait in at breakfast and lunch, nothing looks so nasty as greasy and seedy dress clothes by daylight; the officers' servants should all have coats of the same pattern so as to be uniform when told off to wait.

Cleanliness and tidiness.

The Mess butler can soon be taught to take a pride in his silver and glass and to take an interest in flower decorations for the Mess table and the ante-room; he must be made to notice dirt, cobwebs and dust and taught to keep the ante-rooms, Mess rooms and lavatories tidy at all times of the day; and to see that dirty glasses be not left on the tables or newspapers and cigar ashes on the sofas and floors. But, here again the ways of the servants will entirely depend on the way of the master.

Expense cellar.

It is advisable to give the Mess butler a small expense cellar or cupboard, which he will be responsible for. The large cellar book, shewing receipts and issues, will check what is issued to the butler during the month. He should keep on a slate the daily account of each officer which will be entered every morning by the clerk in a large Mess and by the Mess Secretary or butler in a small one, in the day-book; the butler's wine account can be checked at the end of the month by the cellar book and day-book, and the number of glasses of different sizes that bottles hold should be previously measured and entered in the book; there will be of course a certain

Surplus

surplus to be accounted for, as glasses are not as a rule filled; it is this surplus that pays the Mess and makes the wine fund.

Butler not to pay bills.

I strongly recommend that the Mess butler be given no cash and that he be not allowed to pay the catering bills; I have known several good servants ruined by lax discipline in this respect, who, if they had not been allowed the handling of Mess money, might have kept quite straight.

The pantry should be made comfortable and kept neat, also the butler's room, for good servants will never stay if the surroundings are dirty.

Servant's roster.

The bâtmen must all be placed on a roster for Mess duties and the hours of duty and days of waiting at dinner must be strictly enforced; in a large Mess there will be three or four permanent Mess servants, in a small one probably only two.

A two battery Mess establishment would be :— Staff of small messes.

One butler, one waiter and a kitchen-man under the cook. The butler would get say 25s. a month and food, the waiter 15s. to 20s. and the kitchen-man 15s. The butler might draw his rations into the Mess and the other two might feed in barracks if necessary. The butler and waiter should receive shoes, ties and Mess clothes, which should be made by a good tailor, not by a soldier, so-called, master-tailor; if clothed by the latter they will look more like convicts than a gentleman's servants.

The most important tradesman is the butcher. Make friends with the butcher and go and see him constantly if you wish to have old and tender mutton; when he finds out that you know Southdown from Dorset and three-year-old from yearling mutton, he will begin to respect you. The best butchers I have met have been sportsmen as a rule, the worst I ever met was a preacher, his mutton was very tough, like his discourse. Tradesmen.

Meat when delivered from the butcher should have the weight ticket on it and date when killed, the weight should be entered in the day-book to check the bill by.

Fishmongers in country towns are not as a rule good, and anywhere where you have a good express service and are within three hours of London, it is far better to deal direct with the Army and Navy Stores, they are the best fishmongers I know of. When at Christchurch from 1887 to 1890 we dealt with them and never had any bad fish during that time, neither was the fish ever late; fishmongers in London will supply fish at a given rate per diem. I paid the Army and Navy Stores 9d. a head a day for first class fish, but if you take the common sorts in turn, such as haddock or halibut, they will do you very well at 6d. Fish for five was found enough for eight for dinner and nearly enough for four at breakfast and dinner; fish is cheap in a Mess and you should have a good supply always. When you have guests a post-card to London the night before brings down whatever you want. Fish. Army and Navy auxiliary stores for fish.

When quartered in a country place but little game is as a rule bought, the Mess is generally amply supplied by the good friends with whom the officers shoot. At all out stations in England I have been at, we generally had more than we could manage. If game has to be bought, the Army and Navy Stores again is the cheapest place to deal at. With regards to poultry, the Mess Secretary, with but little trouble, can generally find out some farmer's wife in the neighbourhood who will supply the Mess direct and save the middle-man's profit. I have constantly done this and it does good to the farmer; on the same principle, officers when possible should buy all their forage direct from some farmer in the district who grows it. Game and poultry.

It is extraordinary how hard at times it is to get good butter in the country, and here again I should advise dealing direct with the producers; there are, however, creameries springing up in all country towns and farmers now generally sell their milk direct to these firms. Milk and butter.

I think greengrocers are as a rule the most unsatisfactory tradesmen, they usually supply stale vegetables and make big bills; they should be most carefully watched and everything should be sent back Greengrocers.

Mess garden.

at once that is not fresh and also their day-book must be carefully checked. Whenever there is a bit of garden attached to the Mess, make every use of it, really fresh vegetables are very often a great luxury; however small the garden may be, you can grow parsley, salads, mustard and cress, radishes, horse radish and tarragon.

Ice.

Ice should not be purchased locally, but in large blocks from London, the freight is not expensive and small pieces of ice as supplied by local tradesmen do not keep and are expensive; a large sized refrigerator that will hold a 40 lb. block at a time should be in the pantry for soda and butter, and wine when required.

Wine merchant.

For wine in a small Mess the best way is to go to some really first-class firm, there is generally some good old-fashioned house in each county, such as Oldfred of York, Hervey of Bristol, Kenneway of Exeter and many others. Ask them to supply the Mess as you want it (Mess cellarage accommodation is not generally large), with each class of wine of the best; a really good champagne, port, light claret, after dinner claret, port, sherry and marsala; avoid cheap new champagnes, so-called extra dry, they are all poisons and artificially doctored to make them dry. When you do give champagne, give nothing but the best, it does not cost much more at the end of the year for it is not often drunk and few can drink it long.

Cheap champagne poison.

Also a couple of big dinners in a small station with bad cheap champagne and the battery or detachment may be socially damned for ever.

Don't keep fancy wines.

It is a mistake to have too many wines in a Mess, and never fill up your cellar with fancy wines; the taste for a novelty always goes off in six weeks; pay your wine merchant every two months something on account and he will always take back what you do not want. In large Messes I am in favour of dealing direct with the growers for clarets, whiskies and Madeira, bottling them in the Mess; you can sell sound light claret much cheaper by so doing.

Bottle your own claret, etc.

Cigars.

Keep in a small Mess three good cigars, 5d., 7d., and 1s.; put yourselves in the hands of a first-rate man, get a few boxes at a time and keep them in a cupboard near the ante-room fire-place or in the kitchen. I don't know a better man to deal with than Duncan of Glasgow; get cigarettes weekly fresh by post, a stale cigarette is unsmokeable.

Bad cigars.

In a large Mess of course you can have many sorts of cigars, but whatever you do don't allow the messman to supply them and don't go to second-class dealers: bad wine is very nasty and unwholesome, but I think bad cigars to a connoisseur are a greater trial; you cannot get good cheap cigars, they do not exist.

Catering bills to be paid regular.

All local tradesmen should be paid monthly by cheque. The wine and cigar merchants may be paid as their goods are consumed. Bills should be rendered on the 1st of the month and paid about the 10th to 15th. The catering account should be made out by the 3rd or 4th inst. and the Mess bills should be sent out checked by the Secretary about the 5th and should be paid by the 10th.

Price of Messing.

The price of messing will vary somewhat according to the numbers in Mess and a great deal with management. In a Mess of from five to eight members I do not think you can have three real good meals a

day under 5s. 6d. to 6s.; in a large Mess it can be done from 4s. 6d. to 5s. a day. For this things should be nice and the feeding good. Of course some stations are dearer than others and so it is almost impossible to lay down any exact price. All extras, however, afternoon teas, suppers, sandwiches or biscuits must be charged for: these charges for meals will not include more than half of the cook's wages.

No meals should be sent out of the Mess unless to sick officers and no crockery, glass or plate should be allowed to be taken to officers' quarters.

Entertainments.

In giving large entertainments, ball suppers, garden parties and the like, if you assist the cook with ready-made dishes from London (Army and Navy) a deal of trouble and expense may be saved. Hams, tongues, game pies, quails, aspics, cold cutlets, all sweets, fruits and flowers are supplied at wonderfully reasonable prices and come down very well packed from London in a few hours.

Check the empty bottles.

Where much champagne is used, the empty bottles should never be allowed to leave the room until counted, this is a great check on pilfering.

Lock the supper room door.

At the close of a ball supper, some officer should lock up the room, which should not be opened till next day by the Secretary, who can, with the butler and the cook, check the dishes fit to be used for luncheons and breakfasts; otherwise, if the room be not locked, it is more than possible that nothing but scraps will be found; I have known this occur more than once; servants at 4 a.m. after a ball get a bit out of hand at times. A ball supper properly managed does not cost half what people would think, and the members of the Mess lunch and breakfast on the spare hams, pies and tongues for a week after if the doors be locked.

Hours.

In a Mess the hours for meals should be kept very strictly: breakfast, say from 8 to 10.30; luncheon, 1 to 2.30; dinner, as suits. Any one wanting meals at odd hours should pay extra, a stated price being fixed. Unless regular hours are kept, the servants cannot possibly get through the work.

Servants to be given leave.

The butler and waiter should be given a night out once a week, and the butler and assistant should take turns to sit up when late hours are kept; the cook will also want a night out now and again, but this also can be easily arranged; servants must have leave, otherwise they will not stop. If you can get the butler to take an interest in the Mess garden, his health will benefit and the garden will improve.

Glass and crockery.

The plainest glass is the best and cheapest, club pattern, short, straw-stemmed glass (Army and Navy Stores) stands wear and tear well and always looks neat, also you can always replace breakages with the same, nothing looks much worse at table than odd glasses. Crockery of the regimental pattern can always be purchased at very cheap rates; the Worcester Porcelain Co., Worcester, are good wholesale people to deal with.

Furniture.

Local furniture shops are dear and none too good, it is better to send to a large London firm and they will send down a man, who will see your rooms and take orders; their prices are most reasonable and their things very good. Be sure you have at least four or five real easy

chairs and a good sofa in the ante-room, and have nice solid chairs with leather seats for Mess. What looks worse than cane-bottomed chairs covered with cushions tied on with tapes?

Messmen. Most large Messes are run by messmen, this saves a great deal of trouble and worry and where you have not the services of a first-rate man as Secretary and caterer, a messman is, as a rule, cheaper than catering; the messman contracts to supply so many meals a day up to a certain standard at a fixed price; thus you can calculate almost to 5s. what your messing will cost you for the month. There are many very excellent messmen and of course some very bad ones, but messmen are quite sharp enough to know when they are well looked after and when not, and act accordingly. A messman in a big Mess as a rule looks chiefly to make his profit on extras, but many, if not watched, make their profits by giving second-class meat, inferior fish, cheap American bacon and hams and bad stores. It is by far better to make a fairly liberal contract with a really good man, than to try and run him too fine. At the contract prices I have known in some Messes, it was absolutely impossible that the messman could provide first-class meat at all.

A liberal contract should be made with the messman.

In a large Mess 6d. a head a day makes a vast difference to the messman, but individually it only makes a difference to the members of 15s. a month. Surely there is great comfort in being well fed for 4s. 6d. a day and great discomfort in being badly fed for 4s.; yet how often is this lost sight of. There is an idea somewhere that you can have three good meals a day in a Mess for 4s.; I have never done so, except in Limerick and there we had a cook among the battery women, a very good and careful woman who almost looked on the officers as her children (Mrs. Tomlins in E/4, 1873). We certainly lived well and our messing never cost over 4s. 6d. Messmen supply their own cooks and have to pay them out of the messing, though it is a better plan, I think, to partly pay the cook out of the subscriptions.

Cannot mess for 4s.

Extra messing. Extra dinners and suppers, and guests' meals, should be paid on a fairly liberal scale, a messman cannot provide a dinner as officers expect on guest nights for 3s. 6d. or yet 4s. a head.

The messman should be made to get all supplies from first-class tradesmen and the Mess Secretary should constantly see the supplies.

No one in the Mess should be allowed to find fault with the messman but the C.O., the President of the Mess and the Secretary.

See the messman's bills. It is advisable to see the messman's receipted bills monthly; if he defaults, the case will probably be given against the Mess and the members will have to pay; this has been done. Crying down credit is not really much use; local juries will probably be composed partially of the tradesmen or their relations.

A messman should be given every assistance and help to do his work; as I have said before, there are among them many most excellent men who take a pride in feeding their regiments well. Never take a very low tender from a messman, it means having constant worries and being starved and poisoned.

India. In India we find catering Messes and messmen as at home and the routine is much the same in most respects; the cooks are fairly good

and learn quickly; the Genoese and Mugs are the best; they are all, however, very dirty as a rule, and unless kept up to their work daily, lapse at once back to their own dishes, which come up day by day to dinner under different names, mostly written in bad French.

2nd class meat.

In India more care than ever has to be taken about the meat and all the stores; both cooks and messmen will otherwise get second-class meat and charge you for first-class. They sell in Indian bazaars two classes at two different prices; damaged and old Europe stores are most dangerous and many an illness may be traced to the use of them. Messmen in India invariably have bad tea and coffee and should on no account be allowed to provide them or any other stores themselves.

Old stores most dangerous.

Cooking utensils.

The cooking utensils must be most carefully inspected weekly and those made of block steel should be used, the copper ones, when fresh tinned over, are not always safe, as much lead is at times used in the process of tinning.

Bad milk and water.

Whereas the milk supply for the men is looked after most carefully in most corps, in many officers' Messes no care whatever is taken about either the milk or the washing and drinking water; officers constantly are drinking in the Mess and their own bungalows bazaar milk when the regimental dairy is close at hand. I attribute half the cases of enteric fever among young officers in India to bad milk and water got both in the Mess and their own houses; there are no such dirty men as the ordinary Kitmaghars or such lazy servants.

Enteric fever.

Messman's cook pay direct.

When you employ a messman in India, I think the best plan is to get the cook for the messman and pay him his wages direct and not through the messman's account, you will probably have a better cook and he will serve the Mess better, than if the messman had him entirely in his power.

In a small Mess get a first-rate cook and let him cater; I have always lived better myself in small Messes both at home and abroad worked on this system.

Abdars.

The old Abdars or wine butlers in India were as a rule first-class servants, but the class appears to be dying out; with ice and modern appliances they are not so requisite.

Table servants.

Indian table servants are fairly good if well organized under a smart head man, the Portuguese and Madrasees are by far the best, the further north you travel the worse the servants get and in the N.W. Provinces the Kitmaghars are a lazy, dirty lot.

English head servants.

One or two English servants are found in most regimental Messes and it is essential to a good Mess to have them, to get the natives to work, to clean the plate and to superintend the waiting at table. Native servants must have a man to direct them when waiting, otherwise they tumble over each other, or stand behind their own masters with their arms folded and do nothing.

Price of messing.

The price of messing in India is not heavy, but depends of course a good deal on the number of English stores used. Meat and vegetable are fairly cheap; you should manage to do well in a small Mess on from 2/8 to 2/12 rupees a day for two meals, breakfast and dinner or lunch and dinner; in a large Mess say 2/4 to 2/8, these prices not including the cook's wages. It may be done cheaper, but not well.

For these prices, however, you cannot use much ham, bacon, anchovies and other European stores.

Accounts. A few words about Mess accounts. Both at home and abroad there is a regular system of accounts laid down which has to be adhered to and which is simple enough to follow. As to defalcations by Mess butlers and Mess sergeants, they are frequent, and I have known of many during my term of service, but in every case I can think of, those defalcations came from one and the same cause, viz., gross carelessness on the part of the Mess Secretary, and nearly always from the custom of giving the butler money to pay bills with and not paying direct by cheque. If the Mess Secretary pays every bill by cheque and himself enters all monies received and sends the same at once to the bank, it is almost impossible that any serious loss can take place. In India it is still more simple. A native banker (shroff) keeps the Mess account, all payments are made by cheques on him, and his agent attends every day at the Mess office to take any cheques or monies and to sign receipts in bank-book for the same. No monies need ever pass through the hands of the Mess sergeant or butler. All Mess servants should be paid monthly in the presence of the Mess Secretary, and no orders should be given to tradesmen unless signed by the Secretary, who keeps an order-book with counterfoils.

In concluding these notes, which are more numerous than I had intended, although I have gone but skin deep into the subject, I must say that a well and nicely organized Mess, with comfortably furnished rooms, nice glass and silver, fresh flowers and with good though not expensive food and drinks, keeps men together in a wonderful way.

Conclusion. Many will remember the Exeter Mess in the '80's with Hunt and Bethell and that most excellent cook Mrs. Walters (many an *entrée* have we puzzled out together). I have never seen so good a Mess before or since, or such a good lot of fellows as were living in it in those days. We scarcely ever wanted leave for long, we were so happy.

At Dorchester and Christchurch I have also been comfortable and lived like a gentleman on the best of everything, also Newbridge in the days of old Hunter and his wife and again in the Firman period was hard to beat in the way of good living.

In none of these Messes was the price of living very low, though certainly for what we got not too high, I never heard any grumbling at the expenses and I never knew of anyone ruined by them; but I do know that the comfort of the Messes kept us together and helped to make us good friends and sociable. If, on the other hand, the Mess is uncomfortable and dirty and the food bad even though cheap, as often is the case, men are driven out of it and go to London and other places more frequently, where they spend more in three days, than the extra cost of living well in a really comfortable Mess, would come to in three months. I write from experience.

MAJOR THOMAS DYNELEY, 1827.

Commg. D (E) Troop, Royal Horse Artillery.

LETTERS

WRITTEN BY

LIEUT.-GENERAL THOMAS DYNELEY, C.B., R.A.

WHILE ON ACTIVE SERVICE

BETWEEN THE YEARS 1806 AND 1815,

ARRANGED BY

COLONEL F. A. WHINYATES, *late* R.H.A.

(Continued from p. 416, No. 8, Vol. XXIII.).

Letters VIII., IX., X., XI., XII. and XIII. touch on the movements at the beginning of the campaign of 1812, the battle of Salamanca, the pursuit of the French army, and the subsequent advance on Madrid.

LETTER VIII.

(To Mrs. Dyneley).

Castello Branco, *May 22nd, 1812.*

I think in my letter of last week to Baynes,[1] my dearest mother, I told him I had not received a line from Bloomsbury Square[2] by the mail of the 21st, but I have now to thank you for yours of that date and also one of the 29th. I wish you had put a paper in of that date. As it happened it would have been a very interesting one, for it would have had the Tuesday night's *Gazette*, by which I find my friend Burgoyne[3] has got a Lieut.-Colonelcy, a lucky dog, but not more than he deserves if they had made him a Major-General. Poor George,[4] I wish they had given it to him also, he is another worthy fellow as

[1] Captain Charles Baynes (Kane's List, No. 1092). He was employed in the naval attack on Santa Cruz in 1797, and is thus mentioned by Sir Horatio Nelson. "I must not omit to acquaint you with the satisfaction I received from the conduct of Lieutenant Baynes of the Royal Artillery, not only from the ardour with which he undertook every service, but also from his professional skill."

He had two brothers in the Royal Artillery besides Henry, already mentioned, viz., O'Hara (Kane's List, No. 1215) and George Macleod (Kane's List, No. 1375). They were nephews of General Sir John Macleod, D.-A.-G., R.A. Captain Charles Baynes married Captain Dyneley's third sister.—Ed.

[2] The Dyneley's London house.

[3] The future Field-Marshal Sir John Burgoyne, R.E.

[4] George Macleod mentioned in letter No. IV.

ever lived. I heard from him yesterday from Lisbon, and am happy to find he is doing remarkably well; he did not at that time know when he was likely to sail.

I wish with all my heart and soul that my hounds, you complained so much of, were howling under my window. If Charles[1] has not yet sent them, tell him to write to a Surgeon of ours at Portsmouth named Bennett, and ask him if he will take charge of them to forward to me.

Tell old "Pickles" that she need not be uneasy about me at present. Times have been when I should have been perhaps happy to have some of her cats' meat; but since the first of this month I have been doing tolerably well. *Soupe* and *bouilli* and Tagus salmon, a joint of meat and a pudding every day. Tell her I have got plenty of eggs, flour, milk and spices, but I can't make a batter pudding, it always comes to table as hard as a stone. I daresay it would astonish the old girl to have heard me give directions for 15 eggs (at 4½ a piece) to be put into a plum pudding; but it was prodigiously fine. You tell me William Lyon has at last turned soldier. The Earl of Bridgewater's Regiment is the 14th Light Dragoons, light division, and a very fine regiment it is; so far he is a lucky fellow, I am glad he has not taken the infantry, I do not think it possible he could have undergone the fatigue. I suppose it will be some time before he will be allowed to join, but when he does, tell him to bring out three good horses, not too large, a good pair of saddle-bags, not too much baggage and nothing useless.

I begin to be pretty well tired of remaining here, but we have very little chance of a move until his Lordship has completely revictualled Ciudad, which will take him some time. You have all got vastly fine ideas in England of our marching for Seville, relieving Cadiz, etc., but I tell you it is all a farce. Where are all the men to come from in the first place? Then it is not the time of year nor the country to make marches in. General Hill's army has now gone to destroy the bridge of Almaraz,[2] and this army is employed repairing that of Alcantara.[3] Enclosed are three letters for Jane to read, one from a German doctor to whom I sold "little Dan." I gave the fellow a trial and he liked him much and sent me the money; two or three days afterwards "Dan" kicked him off and has continued to do so every time he gets on him. You will see my note, I was sorry for him but could not accommodate him.

The other is an old letter received soon after my arrival in the country from the apothecary of Christchurch with a pretty niece, who I have, (if it meets with Jane's approbation), some idea of taking for my own, she would just suit Jane, and she can talk about her sisters Agnes and Constance, besides, I am sure the name corresponds so completely with my own character that you will instantly see the propriety of the union.

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[1] His brother.

[2] The bridge and works at Almaraz were destroyed on May 19th, 1812.

[3] The ingenious repair of the bridge of Alcantara, a model of which can be seen in the United Service Institution, Whitehall, was designed and carried out by Colonel Sturgeon, Royal Staff Corps, originally an officer of the Royal Artillery.—Ed.

Poor man, he is sure the climate won't agree with me.

You say Miss Scott has not received the cork seeds. There is no difference to the eye between acorns and cork seeds. However, you may tell her with my kind remembrances that I will take care a proper selection shall be made this season.

Give my love to Mrs. Robert Jenner; ask her if she has forgiven me for stopping so long chatting to Robert[1] the night I left London; tell her to make Gilbert a soldier and then he will be ready to come on to *her* staff by the time I must leave it.

An order has just come from Lord Wellington desiring commanding officers of regiments to enlist 800 Spaniards for each English regiment. This certainly makes the cause look better, and if we can but contrive to get on in that way we may do something yet. I am happy to say everybody seems to be of the same way of thinking as myself respecting the hardness of the case of the 2nd Captains of artillery in not being allowed the brevet. Don't you think something could be done to secure it for us on our promotion to a company? There is nothing like having an anchor to windward, and that anchor to beat while the iron is hot. Let me know what is said about it, and it would be very well worth your while to try and get it for me; because, though perhaps you may not recollect it, for it was as far back as when I first went to be a cadet, I remember complaining that your drawing-room carpet at Hill Farm was very shabby, and you said you would wait until I was a General, when you had no doubt I would make you a present of one.

Give Colonel Fisher's[2] note to Baynes. It will amuse him to see his friend "Fitz"[3] has been in a passion with his hospital steward, a German, tell him not to let "Fitz" know he has made the discovery, or he will blow me up. Tell Jane all the redress the poor fellow got, was Colonel Fisher's asking him, "if he would be kicked for 6d. a day." I have not seen anything of Henry Baynes since he left us for Nisa.

When any of you write to Sir William Marvellous do not forget my kind regards.

Send me out in the next letters two or three much stouter whip lashes, those that came with the whips were too slight. I believe I said in my last that I should not be able to save "Johnny Raw's" eyes. I am so much pleased with "Bobby" that I would not take 150 guineas for him, if we part it will be for 200.

Tell William Lyon to bring iron chains for his head-collars, and some strong canvas nose-bags.

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[1] His first cousin. Mrs. Dyneley and Mrs. Jenner of Wenvoe Castle, Glamorganshire, were sisters, Miss Birts of Wenvoe.—Ed.

[2] Commanding R.A. in the Peninsula.

[3] Assistant-Surgeon Fitzpatrick mentioned in letter No. II. He retired in May 1830, and settled in London, where General Dyneley used to consult the old friend and medical attendant of his campaigning days, who died at Bath in 1852.

LETTER IX.

(To Mrs. Dyneley).

Camp before Quadrazaes, *June 4th, 1812.*

My letter of the 1st to Jane would tell you, my dearest mother, we were to commence our march the next morning, which we did and got over our day's work remarkably well, but yesterday the weather was so intolerably hot we had to give in at 10 o'clock, leaving unfinished two leagues of our march. Macdonald went on to report the circumstances to the General, and left me encamped with the troop. I moved off this morning at three, but having so long a march before us I did not reach this ground until past one o'clock. As the road lay principally over the mountain tops we did not suffer much from heat. As soon as I get to my ground, I have my tent pitched and bed put down and have a couple of hours' sleep, after which I am as fresh as a lark. Our living, as you may suppose, is not so good on the march as in quarters. To-day, for instance, the ox, part of which we are to have for dinner, did not come off his march till an hour after us. Notwithstanding, I have no doubt but that I shall relish it quite as much as if it had been hanging in Newport market for a week; besides I have a cask of good wine with me and shall not forget my three bumpers.

We are off again to-morrow at four o'clock for Aldea de Ponte where we are to receive a fresh route; where that may take us, puzzles most of our heads. I believe I told you in a former letter, that our late General (Alton) had been removed to the light division, and replaced by General Hope, who, I am much afraid, will not remain with us long, he is so dreadfully afflicted with the gout; he is now travelling at the head of the division in a spring waggon. I hope, however, he will be either well or relieved before we fall in with any of our French friends, for our second in command is a German, and we might have a cleverer fellow.

I suppose by this time Robert has received my draft for £75.

Thanks for your letter of the 7th ultimo. I understand another mail is in the country, but we have not yet got our letters.

June 5th.—Here we are still! As I was not engaged to either a ball or supper last night, I went very quietly to bed about half-past seven, where I had not been more than an hour, when I was told we were to halt here to-morrow. I have just been into the town to read the papers up to the 15th, which I am sorry to see confirm the reports of Mr. Perceval's murder.[1] The poor Chancellor, I pity him much; and Miss Scott, if I remember right, was very intimate with Mrs. Perceval. Everybody in this country seems to wish Bellingham may be hung, drawn and quartered. I have just bet a guinea he will not suffer death, which I most sincerely hope I may lose.

Thirty French deserters have just passed through the camp. They all agree in stating that a large force is collecting at Salamanca, they

[1] Early in May, 1812, Mr. Perceval, the Tory Premier, was assassinated in the lobby of the House of Commons.—Ed.

also say that there was a report that Soult and Marmont were ordered to France to take their trial for the loss of Ciudad Rodrigo, Badajos and Almaraz, and that Joseph is to have the command of the army in the north. We are now in the most beautiful bivouacking ground I have ever seen in the country. When we march to our ground we choose our trees by seniority. I am in high luck to-day for Macdonald overlooked the one I have which is one of the most beautiful chestnuts I have seen; it measures exactly 24 feet round the trunk, and has shade enough for at least 16 tents, and no doubt has the rank of commander of the forest.

I shall send by this packet, to the care of Agnes, one of the French cartridges I found at Badajos, which were made on purpose for the breach. I wish you would send it to Mr. Freeling. If he has not seen one, I daresay he will think them curious. Nearly half our men were wounded by them, and have recovered and joined the army. I saw 600 men march through Castello Branco, every one of whom was marked by them.

We have received our order for marching to-morrow morning at three o'clock.

LETTER X.

(To Mrs. Dyneley).

La Puebla, *June 9th, 1812.*

We marched as we expected, my dearest mother, on the morning of the 6th; on the road our route was changed from Aldea de Ponte to this place, two leagues further, and we arrived about one o'clock. The next morning at daylight I mounted my horse to ride over to head-quarters at Guinaldo to see "Old Fram," who, I had heard had broken both his shins and blackened one of his eyes by falling over a log of wood in the street; however, he was not so bad as I expected to find him. He was exceedingly glad to see me and I stayed with him till about 10 o'clock that night. On my arrival at home I had the satisfaction to find we had orders to turn out at half-past 12, as we, the 7th division, were to be reviewed by his Lordship the other side of Aldea de Ponte at 5 o'clock a.m. We got very well over this and returned here about 12 noon. His Lordship is a man of few words, but I understood he was very well pleased with the appearance of the whole, and expressed his approbation at the condition of our horses.

When I was at head-quarters I called and left my name upon his table. From what I could hear there I believe we are now certainly on our march to Salamanca. The whole army is to be assembled to-morrow, excepting Sir Rowland Hill's corps. From a letter I have this instant received from "Old Fram," I find he is also following our route. I pity the poor French in the north and the poor Spaniards in the south. If I am not much mistaken they will both get a pretty good dressing, that is to say if they are not very quick on their legs. I am in beautiful health myself and anticipate the pleasure of routing the scoundrels in the north with no small degree of delight. I suppose the day after to-morrow at farthest we shall commence our march.

We have a report of a paper of the 13th being in the country, by which I find I have lost my bet, and most happy am I to find that wretch Bellingham has been executed. Hanging was too good for him, I would at least have had his finger nails torn out first, or some other worse torture could I have invented it.

Between 20 and 30 French deserters came into Guinaldo while I was there; they desert in hundreds and remain in the mountains until they have an opportunity of coming over to us.

None of you, in your late letters, have said a word about my greyhounds; now don't get into your old custom of thinking, for although I shall be some little way in advance of Lisbon, yet I have plenty of friends there who will receive and forward them to me. Tell Henry Freeling I am very much obliged to him for the army list, it was very acceptable, as the last I received from Bloomsbury Square was for the month of July. Tell Robert I shall be much obliged to him to send me out by the first packet a scythe and a whet stone; we have nothing to cut our grass with in the country excepting sickles, and with a scythe double the quantity of grass might be cut in half the time. I wish you would always say in your letters the dates of those you receive from time to time from me. I hear of your having received none from the history of the goat until the 23rd April.

LETTER XI.

(To Mrs. Dyneley).

Alba de Tormes, *July 23rd, 1812.*

For fear a mail should go away without my being able to give you a line, my dearest mother, I have taken this opportunity of halting on the march to say I am in high health and spirits. Had we had but a few hours more daylight last night I do really believe the whole French army must have laid down their arms.[1] God bless you all. Do not imagine I am fatigued. I have just washed my face, the first time for these three days and am as fresh as a lark.

[1] The battle of Salamanca.

LETTER XII.

(To His Brother John).

Nava de Setroval, *July 25th, 1812.*

Though I wrote to our dearest mother the day before yesterday, my dear John, I do not think it at all improbable this may reach you as soon, but before either letter, you will have received his Lordship's despatches, which would tell you we had at length come up with Signor Marmont and given him a pretty good dressing. It certainly was done in a very superior style and was a most beautiful sight. Our troop was stationed upon a height from which we could see nearly every man of the two armies, and I really flatter myself that never did artillery make better practice than our six guns on that day. We fired 492 rounds, very few of which did not go into the heart of their columns. Baynes will tell you it was not any joke for them whenever we played upon them for a considerable time with "round seven" [1] and canister at 800 yards, and most fortunate fellows we were to get at them at all, for our division (the 7th) did not fire a single shot. The light, 1st and 7th, were not at all engaged, therefore you may suppose how our fellows, that were, must have fought to have driven the scoundrels before us the way they did.

On the day of the battle after a very few minutes fighting, an order from his Lordship came desiring me to get my guns upon a height to receive an attack the enemy were about to make. The order I received had certainly a very awkward signification: "His Lordship desires you will get your guns up that height and wishes you to defend it as long as you have a man left to your guns. In the event of your being obliged to retire, you will spike your guns and leave them and the General officer commanding has most positive orders that he supports you to the last; in fact," his Lordship says, "he must have the hill kept."

From these orders I made sure of an "ex" or "dis"—tinguish. I got my guns up with the assistance of a company of the 40th regiment, unloaded my limbers and sent them and my gunners' horses to the rear, as I thought, if we had to run for it, my men should get away as fast as the infantry. On arrival on the hill I had some satisfaction in finding my friend General Cole in command, knowing there was not any run in him. But the enemy never put us to the test, and his Lordship came up about three hours afterwards and turned the tables by sending for the other four guns and attacking the hill from whence we had expected to be attacked.[2]

The hill we attacked was exactly the same height and size as our own and distant 700 yards. As soon as the enemy discovered we were

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[1] At this date there were two kinds of case shot used with field guns, viz., "heavy" and "light." With light 6-prs. the former contained twelve 8½ oz. balls and weighed 7 lbs. 3 ozs., the latter contained thirty-four 3½ oz. balls and weighed 7 lbs. 7 ozs. It is probable the heavy description was called "round seven," and sometimes grape. *See* "Pocket Gunner" for 1813, pp. 9 and 344.—Ed.

[2] These hills were the two Arapiles, positions which had considerable influence on the fortunes of the day.—Ed.

advancing, they got four guns up, but our fire obliged them to retire before they had fired four rounds. Our infantry, two Portuguese regiments, then stormed the hill which the French let them get to the top of before they opened much musketry. Then they did pepper them most dreadfully and beat them down again, and notwithstanding the fire we had upon them, they advanced within range of our canister which, however, it was impossible for them to stand, and they fell by hundreds. The enemy had a party without arms in their rear for the purpose of stripping and plundering our wounded, which I saw them do; for they had the poor fellows naked before they had been down two minutes. Poor Cole then went and carried the hill in most beautiful style, but accounts were soon brought of his death.

When firing had ceased I went out mounted with Reed, furnished with a pickaxe and shovel to bury him. I was out nearly two hours by moonlight examining every body, but returned without being able to find him. The next morning, I heard he had been carried to the rear very badly wounded, but this morning I am sorry to say I have heard a report of his having died last night at Salamanca; still I am in hopes I may be misinformed.[1] The moment before he left the hill he paid me a very pretty compliment. He had left the command for about half-an-hour and on his return, Downman whispered to him that four guns had opened their fire on us, but that we soon dismounted some and obliged the rest to retire. Cole then turned to me and said, "That was no more than I expected from Dyneley; I have seen him serve them that trick before." We had in action at least 100 pieces of cannon playing at the same time.

I scarce know what I have written, I am certain I have not told you half I should have done had I written yesterday, but since then I have been terribly annoyed by the loss of "Old Maida." I was obliged to have a pistol put to her head last night, in consequence of her hind leg being broken all to pieces by one of our carriages running over her. It happened on the march, on the very spot where the heavy dragoons charged the rear-guard of the enemy.[2] I carried her on till we halted and buried her on the field of battle in a grave six feet deep and filled it up with broken bottles to prevent the wolves from scratching her up.

Bob Douglas is now with me in my tent and desires to be kindly remembered to all. He went into action with one of the finest divisions, the 3rd, commanded by General Packenham, and his pieces did cut the fellows up in form. He had some extraordinary escapes, two shots passed under his horse's legs; he got a lick with a stone in the eye (but it did not stop his winking); he is looking remarkably well and is in good health. You can form no idea of the fatigue our

[1] Lieut.-General the Hon. Lowry Cole recovered from his wound and commanded the 4th division to the end of the war.—Ed.

[2] On the morning of July 23rd, Anson's light cavalry brigade, and that of the heavy dragoons of the King's German Legion, under Major-General von Bock, attacked the rear-guard of the French army near the village of Garcia Hernandez. The attack was both brilliant and successful, von Bock's men breaking a square and taking prisoners three battalions of the enemy's infantry. The order from Lord Wellington for the attack was taken by Captain May, R.A., who joined in the charge and was severely wounded.—Ed.

troops have undergone; many of our poor fellows have dropped dead on the road. We are now at it day and night as if we had just commenced and in as good spirits. I never was better in my life although I have not been in bed or had my clothes off for 10 days; as for washing ourselves, no one thinks of it. Water is scarce and expensive, once in three days is quite enough. Tell my mother to send me out some good tea and a little pounded ginger, these canteens will hold a variety of good things if properly packed and filled, remember the cherry brandy, etc., etc.

Our orders are this moment come to march again, if you have any commands for Madrid you had better send them pretty soon.

LETTER XIII.

(To Captain J. K. Douglas, R.A.).

Aloca del Rey, *August 5th, 1812.*

I am in great hopes, my dear John, you may receive this before you have an opportunity of seeing my letter to Mrs. Close sent by last packet, wherein I grumble and abuse you for an idle fellow; now I cannot sufficiently thank you for your delightful long letter of—I cannot say what date, for as usual it had none. I shall begin to suspect you are in the Fleet, Newgate, or some other pretty little hiding-place, for you never even mention the place from whence you write. Surely if I should be correct in my suspicions, there could be no necessity for keeping it from an old friend. Since you last heard from me we have had a pretty severe time of it, marching and counter-marching ever since the 1st June. However, at last we had an opportunity of coming up with the fellows, and I should think the dressing they got would be enough to last them the next six months at least. They have never looked behind them since and yet the scoundrels have the assurance to say it was not a general action but only a skirmish, but in the said skirmish they have lost 15,000 men. You will see by the date of this we are advanced some way into Spain. The part of the army I am now with consists of two regiments of heavy German cavalry, two strong regiments of Portuguese cavalry, a German infantry light battalion and our troop, under the command of General d'Urban, and is called the "corps of observation and communication." The "observing" part of it left Coca on the night of the 2nd on a forced march of nine leagues to Segovia, taking with it two guns, the light battalion and Portuguese cavalry. On their arrival there they observed Joseph Bonaparte at the head of 12,000 men, who had fled, but returned, and they therefore very wisely retired two leagues upon this place, and we marched next morning to support them and communicate with the head-quarters of the army. Here we have been ever since, not having a word from the other party. I am left here with the command of four guns, Macdonald[1] having gone on with the other two.

On the morning of the action[2] I was very near having an opportunity of getting an "ex" or "dis"—tinguish. There was a small hill in the centre of our line of which the enemy showed a disposition to possess themselves, and I received orders from his Lordship to occupy and defend it as long as I had a man to stand to my guns, and in the event of my being so hard pushed as to be unable to fire any more, to spike the guns and run. These orders were brought me by Colonel Sturgeon,[3] who shook hands and wished me well over it, thinking, I

[1] A valuable collection of medals and orders were lately sold at Sotherby's. Among them the gold medal for the battle of Salamanca which belonged to Colonel R. Macdonald, R.A. It fetched £59.—Ed.

[2] Battle of Salamanca.

[3] Lieut.-Colonel Henry Sturgeon, Royal Staff Corps, Assistant-Quarter-Master-General, was an officer of very superior merit, and one of the most trusted of those on his personal staff by Lord Wellington. Lieut.-Colonel Sturgeon began his service in the Royal Artillery (Kane's List, No. 932); he was killed in the affair at Tarbes in the south of France, March 19th, 1814.—Ed.

suppose, he had given me pretty nearly a forlorn hope. However, I had but little to do, for very shortly after his Lordship himself came upon the hill and ordered the other four guns up for the purpose of making an attack from thence upon another hill the enemy occupied about 800 yards in our front, which was done by two Portuguese regiments whom the enemy allowed to gain the height and then repulsed with heavy loss, and absolutely followed them within 300 yards of our guns, when our canister came into play most beautifully, and they did not advance many steps further. They got four guns upon the opposite hill several times, but we beat them off each time before they were able to fire their second round. We fired that day 492 rounds, nearly the whole of which was on columns at not more than 800 yards distant. When the French came down from the hill after the Portuguese, they had a party following them without arms for the purpose of plundering, and I myself saw them strip our wounded naked; however, I am sorry to say we, *i.e.* the Portuguese, are just as bad, for in riding over the field a short time after, I found the poor wretches of Frenchmen lying in every direction without a stitch of clothing on. The guerrillas, you hear so much of are dreadful fellows for this work. If they find an unfortunate straggler alone they instantly put him to death, strip him and leave him. . Every day, as we march through the country, we find Frenchmen in the standing corn, they had fallen in the rear from sickness, and remained there two or three days until our troops came up and then surrendered themselves.

Yes, I have seen Master Robin[1] several times. I shall be most exceedingly annoyed if, before this, you have not seen his name in large characters in the *Gazette*. I should much like to be in the Warren[2] when Sergeant Clark brought the newspaper down, I only hope your father's spectacles will not have been mislaid. I can fancy I see myself as in old times holding the candle for him. I shall have the most infinite pleasure in communicating to my friend Bob the happy state his kit is in. The last time I saw him he was complaining dreadfully of his baggage having been sent eight leagues to the rear of Salamanca, he had not a single article with him but what he stood in, and he was wishing he had brought out more things from England. Now I shall be able to set his mind at ease by telling him "that fellow William"[3] is into the heart of his kit. Do you remember George showing "the Captain" up for having the General's best shoes out a-shooting; he never forgets any little kindness that is shown him, he reminded me the first time I saw him of my attention to him at Bloomsbury Square.

Roda, *August 4th.*—We marched from our quarter in the middle of last night, and arrived here this morning at seven o'clock. Mr. Joseph, with his whole force, having taken his departure for Madrid, our "observers" entered the town of Segovia, but we have not since had any communications with them.

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[1] Robert Douglas.

[2] The quarters in the Royal Arsenal, Woolwich.

[3] Captain William Douglas, Royal Engineers. He is also mentioned in letter No. IV.—Ed.

I fell in with the Commissary-General[1] the day before we entered Salamanca, and, as he says, talked over "scenes of our youth when every sport would please." He has been exceedingly civil to me in his offers of money, (a dangerous offer you will say), or of any service he could render me. Robin and I dined with him at Salamanca, *he*, I am sorry to say, behaved exceedingly ill by laughing when the claret was put on the table, a wine I do think neither of us had seen since we left England. We were sworn friends on that day and drank wine together near a dozen times. Bisset keeps a very good table, and lives exceedingly comfortably.

Segovia, *August 7th.*—You will observe, my dear John, they do not give us much time to ourselves. They were at us again last night and brought us to this place about half a league in front of the town, where I think it is as hot as I have ever felt it. We have not the least covering from a broiling sun, excepting our tent or hut which is scarce bearable. I have been to examine the castle of Segovia which the French left about three days since, and I was not a little surprised to find the large depôt of stores they had left behind of mortars, howitzers, and guns; I think there were about 24, all of which they had destroyed. They had fired their 24-prs. into the mouths of their mortars, and they had gone through and through. They had burnt all their guns and ammunition waggons, and tried by making large fires upon their brass guns to melt them, but as this did not answer they had thrown them over a precipice which rendered them completely unserviceable. There were some hundreds of barrels of powder and ball cartridges from all of which they had taken off the heads and filled them up with water. They began at first destroying the ammunition by throwing it into a drain and pouring water down upon it, but, I suppose finding themselves pressed for time, they finished the rest in the magazines. There are also several thousand stand of arms from which they have broken off the stocks; in fact, every article that they thought would be of the smallest service to us, even to a few yards of rope, they have destroyed, and then set off making the best of their way to Madrid. The "observers" are after them and are now about five leagues in our front and we shall follow them some time to-night. I am afraid, however, we must soon stop, as the army is getting very sickly. The calculation is that each division has 1000 sick, which of course must diminish our strength a good deal, indeed make us unable to cope with them should they make a stand. The town of Segovia is, I think, as fine a one as any I have seen in Spain, and has everything to sell a person can want. When I was there this morning I wanted a great many things, but had not a copper to my name. The army have not had any money since March, nor are they likely to get any. Our friend Bisset takes all that arrives to provide rations for the troops.

When Lord Wellington entered Segovia, it was his intention to have gone by the back streets to his house, but the inhabitants were up to him, and waylaid him at the entrance to the town with a cracked trumpet, an old kettle-drum and two miserable-looking wretches dressed

[1] Commissary-General John Bisset.

in scarlet robes. With this state they conveyed him nearly half a mile to the market-place, where he was obliged to stand with his hat off until they had done "vivaing" him.

Navacerrada, *August 9th.*—We reached this place yesterday at 12 o'clock, a march of six leagues, five of which was against the collar, being over the Sierra Guadarrama by the San Ildefonso pass. We are now within seven leagues of Madrid and four of the Escorial; Joseph being three leagues in advance of us on the Madrid road. From a peasant who left that place yesterday we learn that there are very few French troops left in the town, that the inhabitants are ready to receive us with open arms, and that the Juramentados[1] are deserting Joseph by hundreds. On our march here yesterday I remained behind for the purpose of visiting the palace, or rather the King's hunting box at San Ildefonso, and very much gratified I was with the sight. It is a beautiful place and most magnificently fitted up, and, what is very singular, the French have not destroyed a single stick of it. Our head-quarters were to be there yesterday, and as I left the place I saw the mob getting together with their rusty swords and cocked hats ready to receive his Lordship in the palace. There was a suite of 12 rooms communicating with each other, and stuck as thick as poor old "tuck-me-up" Grinton's could have been with paintings of sorts. How you would have enjoyed yourself there for two or three days! For my part I was very well satisfied in half-an-hour.

How sorry I am the poor Close's are to give up St. John's Wood and the shrubs of all sorts. I shall miss the place most exceedingly, and the many pleasant half-hours I have spent there, or rather the many more I intended to spend there. I shall have no ducks to count, and shall lose my nice little "coze" with my friend Whitehead. What is to become of D———'s pony and the donkey, the cows, the pigeons, etc., to say nothing of the famous hay? In fact it must be a mistake, Mr. Willing cannot want the place. I can fancy I see Mrs. Close enjoying herself looking over the tops of the blinds in her house in town, and I shall have an opportunity of coming in shoes and stockings to dinner, which I never did at St. John's Wood. In fact everything will be turned wrong side outward except the poor old white jacket which you will find some difficulty in doing. However, it will make a delightful pair of trousers for D——— to walk about the square in.

So Master William wants to come soldiering again! Most happy shall I be to see him, only if he is not quite well he must recollect this is not the country to recover in, the fatigues and privations are too great. Tell him on his arrival at Lisbon, he must purchase a tall, stout mule for his baggage, they will ask about twice as much as they ought for him, but that he must not mind; a weakly one cannot go long marches, nor a low one cross deep water. He must take great care he has his pack-saddles well fitted before he leaves Lisbon, or the mule will not be able to go two days owing to a sore back. I am very much obliged to you for the trouble you have taken about the greyhounds;

[1] Spanish officers in the French service.

Colonel Salmon would forward them to me from Portsmouth if you could get them there.

I believe I must stop or I shall lose the mail. I got up early this morning to finish my letter as we are in expectation of an order to march every minute. I hope by this day week at furthest to be at Madrid, but of that I have my doubts. I am afraid of José getting a reinforcement from Andalusia, which is at present much talked of.

(*To be Continued.*)

LETTERS

WRITTEN BY

LIEUT.-GENERAL THOMAS DYNELEY, C.B., R.A.

WHILE ON ACTIVE SERVICE

BETWEEN THE YEARS 1806 AND 1815,

ARRANGED BY

COLONEL F. A. WHINYATES, *late* R.H.A.

(Continued from p. 455, No. 9, Vol. XXIII.).

Letter XIV. gives a detailed account of the affair at Majalahonda on August 11th, 1812, of Captain Dyneley's capture, march with the French army, escape and return to Madrid.

LETTER XIV.

(To Mrs. Dyneley).

Madrid, *August 21st, 1812.*

Long before this reaches you, my dearest mother, I trust you will have received my letter of the 18th, telling you I had given "Joey" the slip. Before, however, I proceed any further, or attempt to relate my adventures, I must beg you will assure yourself, which you have my most faithful word to prove, that I am now in high health and spirits. This is now the 21st, the third day of my return, and I have kept myself confined to my room that I might entirely recover the fatigue I have undergone. I shall take you back to the day I last wrote, the 9th; very shortly after I had sent my letter off we received our order to march at two o'clock in the morning. The troop accordingly moved forward about two leagues on the Madrid road and halted.

At the request of the German Colonel[1] commanding, I accompanied him about a league to the front, for the purpose of reconnoitring the enemy. As soon as their rear-guard opened fire upon us, we retired upon our advance and remained waiting further orders which arrived at three p.m., directing us to advance immediately as far as it was safe; we did so until our vedettes were driven in, and then halted in the road for the night.

At daylight next morning, the 11th, we discovered the enemy's cavalry drawn up about half a league in front of us. We advanced

[1] Colonel de Jonquiéres: in the absence of Major-General Bock commanding the allied cavalry, vice Sir Stapleton Cotton wounded at Salamanca, he commanded the German Legion heavy cavalry brigade.—Ed.

and they retired over nearly two leagues of ground, the Colonel constantly asking me if they were within range, to which I replied, "no, sir, no." At length I asked him if he would allow one of his regiments to accompany my guns to the top of a hill down which the enemy's cavalry was then going, and to this he immediately agreed. Off we set at a trot, from that to a gallop, then to speed, and reached the hill-top just as they got to the bottom, opened fire and put them to flight in style; they made for the town of Las Rozas and drew up to make a stand, but we advanced and drove them through the town.

Soon after Macdonald with two guns came up and took command of the whole troop. We then again advanced and drove the enemy for nearly half a league before us, when they made another stand. I went on with two guns and moved them from their position, and after firing six or eight rounds they retired altogether, leaving us about half a league beyond the town of Majalahonda. We remained there about two hours and then received orders to go into the town and make ourselves comfortable.[1]

Harding and I soon found a house, got breakfast, lay down and had had nearly three hours sleep, and were half dressed again when our Commissary came into the room and said, "they say the French are coming on again." I took this very quietly, but rather hurried my dressing. In a short time a Portuguese officer put his head into the window, frightened out of his life, and stuttered out, "*Muito grande e feroz cavaleria franceza—vega, vega pela janella, Senhor Capitão—com os suos canões, muito brava, brava, brava;*" this is not any language, not a word spelt right, but I give it you as it struck the drum of my ear at the time. As soon as he had taken his departure, I put my head out of the window and sent a man to tell the trumpeter to "sound out" immediately. All the horses were in the stables; some of the men drawing rations, others getting their horses shod, etc.; however, considering everything, they got to the alarm-post astonishingly soon.

Not a soul knew Macdonald's house, nor could he be heard of in any direction; so as soon as two guns were ready, my friend Harding and I went away with them at score to the front, and directed the rest to follow. Just as we got clear of the town Macdonald joined us, he had been asleep in his quarters and by great luck the noise awoke him. He gave directions for the other guns to take the right road and we took the left, the Portuguese cavalry being drawn up between. We had no sooner gained the ground from whence we opened our fire than I saw how the thing was to go with us. The Portuguese wavered, and I turned to Harding and said, "The French will most certainly turn our right flank, I hope the guns there will be able to get away." By this time the French cavalry had gained much upon us and the cowardly scoundrels of Portuguese put about and set off as hard as they could go, leaving only 20 of the German cavalry to protect us. We of course limbered up and away we went at speed.

Now, my dearest mother, give my letter to one of the girls to read a little. And, my dear Eliza, hold up your head and speak out, and

[1] The German cavalry went back again to Las Rozas leaving a picket of 40 dragoons in front of the three Portuguese cavalry regiments under Major-General D'Urban.—Ed.

tell the company that by the time we had galloped 300 or 400 yards, the confusion became very great, the Portuguese had given way in every direction and were flying before the enemy who were close upon our heels. At this time I was galloping about a dozen yards in rear of the last gun, and had continued about a quarter of a mile further when, whether my horse made a trip, or whether one of the cowardly scoundrels in crossing me upset him, I know not, but certain it is that we came head over heels together, and away he went leaving me upon the ground. I was hurt a little by the fall and had one of my shoes nearly torn off my foot. How I escaped being ridden over I know not, for the dust was so great it was impossible to see a yard before one; however, as soon as I got upon my feet and had run about 50 yards, I found the enemy had got in upon one of our right guns, and I saw them cut the drivers from their horses. I thought I had no business there and so ran on and came upon the second right gun which the French had been at; the three drivers were lying dead by their horses' side. I then returned, when I discovered the gun I had left was not in the hands of the enemy but had been upset, and our poor fellows, my friend Bombardier Morgan at their head, had dismounted to right it. I went towards them, but before I had gone many yards, I heard a terrible shriek of "*Avanti, Avanti, ah traditor inglese,*" I looked behind me and discovered about four squadrons not more than 50 yards in my rear. The officer commanding them rode and made a cut at me but I made my bow and escaped. As soon as he could pull up his horse he came at me again. When I saw this I sang out "*Ufficiale inglese prigioniere,*" he then came up brandishing his sword over my head, saying "*Mi dia la sua spada, Mia dia la sua spada,*" all I had to say on this subject was "*si, si, si.*" As soon as he had taken it from me, he opened the pocket of the sabretasche in which were a few old morning states, my tourniquet, and a letter from Moseley, telling me of the death of Mr. Hawkes, and troubling me for £16 12s. 4d. This the fellow seemed very much pleased with (if you ever saw one of Hawkes' bills you will remember they are very fine) and he gave me in charge to a dragoon and rode off, thinking, I suppose, he had at least made a lord prisoner.

As soon as the officer was gone, my guard, with the assistance of two others, set to plunder me. When these fellows first came up they made a cut or two at me but missed, and then brought up with "*deme sua denaro.*" I put my hands into my pockets and brought out 12 dollars, which I divided between them. They then said "*moire*" (more), I said I had no more, upon which they felt outside my pockets, and pulled my cravat about and off, then they sat still and left me alone. I went to the gun and was trying to unhook one of the leading horses in order to make my escape by the right, as they had gone to the left, but I was detected in the act by three Polish lancers, who came galloping down upon me; the instant they arrived they put their lances to my chest and demanded my money. I said I had none, they told me to give it them directly or they would put me to death, I again said I had none, they asked me if I had a watch, I said "yes." At this moment two fresh fellows arrived, and the whole five from

their horses made a dash at me for my time-piece, one of them put his hand into my pantaloon pocket in which was the silver pencil-case Charles gave me, my pocket comb and lip-salve box Dora gave me. The fellow having grasped his booty, could not get his hand out again, and he more than once lifted me off my feet; at last he extricated himself by tearing my pocket entirely out. Finding they had not got my watch, they returned and succeeded in getting it, and made off with it, previously agreeing to share it amongst the five. They had no sooner left me than two other fellows came up with "*deme sua denaro.*" I told them I had given it all up and turned my pockets out to show them. They said I had more. I said "no," upon which they commenced thrashing me across the shoulders with the flat of their swords; when they found they could get nothing, one of them said "*deme sua vestita*" (my jacket). I said I was an English officer and had no other; they appeared a little ashamed and rode off.

A staff officer then rode up and asked me what country I came from? "England," says I, "signor," which seemed to please him mightily, and he took me off to a General officer who was near at the time, who addressed me in English—at least, it was nearer our language than any other. He asked me what cavalry we had in the field, I said 8000; he told me I had told a lie and desired I would speak the truth. I said Lord Wellington had that number with him, but that perhaps he had not at the moment more than 3000 in the field, (though I knew his Lordship had not more than the latter number altogether with this part of the army). The General then rode away shaking his fingers at me and saying I was a bad one.

I was then given in charge to one of his orderlies to be marched to the rear. He had not taken me above 100 yards before he desired me to give up my spurs, a very favourite pair Bertie Cator[1] gave me many years ago at Malta; by the time I had got them off, up came all the poor fellows belonging to our guns, some of them most dreadfully mangled. Though we were all sorry to find ourselves in such a situation, yet we were naturally happy to be together. At this moment a General rode across near me, and I called to him to allow his surgeon to dress my wounded, which he instantly consented to do and I got them bound up as comfortably as I could expect; one poor fellow, a corporal, had nine wounds. I had him dressed first and laid aside, and was attending to another, when the corporal called to me to say he was dying and that a Frenchman was stripping him. I looked round and there the fellow was pulling his boots off; he paid no attention to what I said, and I suppose if I had said much more he would soon have had mine off.

Well, having got the worst of them dressed we marched off to a village (I do not remember the name) about two leagues from the field. On the road there I got most completely knocked up and made Bombardier Morgan give me his arm; however, I soon found I could go but little further and the sentry behind me kept constantly hitting me with the butt-end of his musket with "*allons! allons! coquin.*" I

[1] Lieutenant William Cator (Kane's List, No. 1134).

thought then how Richard Hill[1] would have laughed if he could have seen Master Tom kicked along in that way. At last a dragoon took compassion on me and lugged me along by one hand while Morgan kept the other side up. On our march, I told Morgan in confidence, I intended to make my escape the very first opportunity and that I would take him with me, for which purpose he had better act as my servant; he was delighted with the idea and said he would come into any plan I wished. When we got to this town (the name of which I forget) the General of division, D'Armagnac[2] sent to desire I might be brought before him, and I accordingly set off arm in arm with my "servant."

Now, Miss Eliza, you have, I think, had quite enough, so give my letter to Jane and let her introduce me to the General, which you must do, Miss Jenny, by taking me into a very large court-yard, in which was a table laid out with a most magnificent supper: hot soups, etc., abundance of plate, I know not how many-branched candle-sticks, with every sort of wine. The General was seated in the centre and addressed me in French. What country?—English. He then asked me some other questions, and I said I did not speak French. Do you *Italiano?—Poco.* He then desired me to sit down and take some supper. This was quite out of the question, for eat I could not, but drink I did of his claret and water like a fish. They were all exceedingly civil to me, offered me first of every dish. I got on very well with my Italian and Spanish. At last a very handsomely dressed fellow, who said he spoke English, came up to my chair and addressed me: "How do you do, young gentlemans, you one Englishman?" "Yes." "You know one very fine fellow, one Captain Hoste[3] of the ship?" "Yes I do very intimately." "You do by —— he is one very fine fellow, he dance to the ship." After talking some time he exclaimed, "Oh my —— how sorry I was when Mr. Nelson did die. You one English lord?"—"No." "One squire?"—"Yes." You may suppose, my dear Jane, what my feelings were at meeting unexpectedly with a man apparently as much pleased as myself to talk over the good qualities of my friend. He turned out to be a Neapolitan, and no less a person than the Marquis of Colonna. He said in course of conversation, "I am Colonel of the regiment," and pointing to where Joseph was sitting, "I am a bit of that great house." I afterwards learnt that he was chief aide-de-camp to his Majesty King José. The poor fellow was very civil, and offered me everything he had; however, I saw nothing of him from that moment. There were at least 60 people at supper,[4] near 40 of whom were Neapolitans and were at Naples

[1] His brother-in-law.

[2] General D'Armagnac commanded a division in the *armée du centre* in Spain in August 1812. He was a Brigadier-General in the 2nd corps (Soult's) in 1808, and had a division in the *armée du centre* in 1811, and in the *armée d'Espagne* in 1813.—Ed.

[3] Captain William Hoste, a distinguished naval officer, served under Nelson, who had a high opinion of him. Hoste commanded H.M.S. *Amphion*, one of the ships which accompanied Sir John Stewart's expedition to Calabria.—Ed.

[4] In his memoirs, Vol. II., p. 552, Count Melito writes: "On the 11th August, 1811, a cavalry engagement, in which we had the advantage, took place between these troops and the enemy. We were opposed by Portuguese cavalry and English mounted artillery. The latter lost many men and a few more were taken prisoners. I spoke to one of them, an English Captain of artillery."

when I was there; consequently I got on famously with them. I had my friend Morgan sitting on the ground by me the whole time, and he got a most hearty supper. After the company had taken their departure, we lay down in the passage of José's house, but we were soon disturbed by some soldiers who marched us off to the guard-room, where they gave us a handful of dirty straw to lie upon. I never closed my eyes the whole night, but Morgan made a good snore of it, much to my annoyance.

The next morning, the 12th (the Prince Regent's birthday), at daylight I got up and was looking out of the window when I saw our gun horses going past with those French scoundrels on their backs. I learnt with no small delight from a French officer that they had burnt the three guns they had taken from us, as I knew we should soon be able to replace the carriages.

About an hour after this, I and all the prisoners were sent for to the General's house; he selected all those very badly wounded and put them into a house that the English might fetch them away when they retired. They passed about five of my worst, but those with only one cut or stab they obliged to march on, and in that state they were marching when I left them, without having had their wounds once dressed and yet they were all getting quite well. Just as we were marching off whom should I see brought into the ring but my friend the German Colonel. He had been taken poor fellow after making three or four desperate charges. Oh how the poor fellows of his regiment behaved who were left behind to protect us! They certainly were not more than 20 in number, but the instant they saw the scrape our guns were in, they formed up to support us, which was no sooner done than down came at least 150 cavalry and lancers; the poor fellows fought like men, but of course they were very soon overpowered and every soul of them cut to pieces. Morgan saw two Frenchmen at one of them, he cut down both, when a lancer came up at the moment and despatched him. It was really (if, as Robert says, you could divest yourself of fear) a most beautiful sight to see these fellows coming down upon us. They are dressed in very handsome high brass helmets with a horse's tail fixed at the back which, when they gallop, flies out and covers their back and shoulders. They are armed with a long lance, at the end of which a flag is fixed so that, when our dragoons make a stand to receive them, the flags frighten their horses, and they go about and the lancers have them through the body in the "twinkling of an eye."

Now to proceed: I am marched off in the centre of the column with the rest of the prisoners, 26 in number, 12 of my own, the German Colonel and five of his, a Portuguese Colonel and five of his. The German Colonel and myself are allowed a mule between us, the Portuguese Colonel has to walk. Long before it came to my turn to ride I was so beat I could scarce put one foot before the other, but still they kept shoving me along with "*allons, allons!*" When it came to my turn to mount, I could hardly get up, and when up, I could scarce sit there. At this time up came King Joseph to stare at us, and as soon as he had satisfied himself that we had legs and arms like other people,

he took himself off without saying a word; he paid me several visits of the same kind during my stay but never once opened his mouth. Well, I had gone on in this way with my mule for about two leagues farther when D'Armagnac passed and, seeing the miserable condition I was in, he ordered me to be given over to the Chief of Artillery, Lassole, which was done. I was put in front of his baggage waggon out of the sun, but was shaken to death; in this way they carried me a league farther to Valdemoro, where we halted for the day. The Chief, a Major, had a most capital dinner, but that day I could eat nothing. The meal being finished, Morgan borrowed a blanket of one of the artillerymen (all German, of the regiment called the Baden artillery) and we lay down together and had a good sleep. We were awakened about one o'clock on the morning of the 15th to march again. When my carriage was ready I mounted and off we set. When we had got about two leagues on the road a French General rode up and said, "Are you the Englishman?"—"Yes."—"I marry one English lady." Thinks I to myself, "What of that?" Then he said, "She wish to speak to you."—"Certainly." So out I got, and there sat my lady, who addressed me: "Have I the pleasure to address a countryman of my own?"—"Yes, you have certainly."—"From what part of England are you?"—"London."—"Oh dear London, I should be the most miserable creature in the world if I did not feel certain I should die there, I am so very partial to everything that is English—look here." And out she pulled from the pocket of her carriage an old Twining's tea-canister. This certainly did cut me up a good deal, she then gave me a bit of bread and meat, much in the same way as I had often smuggled it to a beggar at the back kitchen door at Moltingham[1]; I thought of you all. She continued her conversation, said she was a Kentish woman and came from Dover. I said I was from Kent too. She was very much pleased with this, and jabbered away German to the people who were standing round us, saying we both came from the same province in England. She told me she was a daughter of Admiral Drake's, that she had married this man (pointing to her husband) General Chasse in Holland, but that Bonaparte had obliged him to enter the French service, and that for every pound then he had only a shilling now, etc., and concluded by introducing me to the General, who said he had forgotten all his English. The poor fellow then told me in the best way he could that I was welcome to everything he had.

Of course my carriage did not wait for me, and I had about four miles to walk to overtake it. I found the troops had halted half-a-mile short of Aranjuez in a delightful long walk, as much shaded as that at Chislehurst, only 500 times as long, with the Tagus running under the trees. I recalled the many happy days I had spent there previous to leaving England, and thought I would even put up with the rowing I got there for teasing the children to make the exchange.

The city of Aranjuez is, or rather was, the residence of Ferdinand and has a beautiful palace, and I am not joking when I say the gardens

[1] The Dyneley's country house near Eltham.—Ed.

would encamp 100,000 men and the stables hold 3000 horses. The French army remained here this day and the whole of next; you may suppose what work they made with the fruit, etc. The town is now famous for being the first place where the revolution broke out. Nothing particular occurred that day except my planning with Morgan to escape that night by swimming across the Tagus, and remaining in the rushes until we were certain the whole army had passed; but though the poor fellow told me he was certain he could swim across, on cross-examining him I found he had not been accustomed to swim in his clothes, and that he built all his hopes upon being able to do anything on such an occasion. I therefore of course abandoned my design. We had got a loaf of bread with a hole through it which I was to put round my neck. The next day, the 14th, we remained on our ground, and I got Morgan to wash my shirt for me while I sat without; I borrowed a razor of one of the men, and shaved and washed myself and was a good deal recovered from my fatigue.

About four o'clock General D'Armagnac sent his orderly for me to come and dine with him. By the time I got to his house in the town I was very much fatigued and very unwell; this the General saw and asked if I would take anything before dinner, but I refused. When we sat down to dinner I was seated on his right; he asked me what my complaint was, I told him liver, but I had great difficulty in making him understand what I meant. We had a great deal of conversation, and he was highly delighted with the idea of my attempting so many languages, not being master of any. When I spoke German I thought he would have been choked with laughing, for I had only got six or seven words from the officers of artillery. He asked me if I had got any money. I said "No."—"Do you want any?"—"If you please," and he ordered me 50 dollars. Finding I had got completely hold of him, I thought I would try if he would let me go. I told him I was in so indifferent a state of health it would be quite impossible for me to bear any longer the treatment to which I must necessarily be exposed, and so it certainly would have been, for I was then so unwell I could scarce move, and to be exposed to the heat and dust the whole day must have done for me, and I asked him to speak to the Marquis to say a good word for me, which he promised to do. The conditions on which I asked him to let me go back were that I would give my parole not to serve against them until I was regularly exchanged by his Lordship. This being all settled and the clock having struck eleven, my friend Morgan and I walked home in charge of our guard, got our blankets and went to bed.

Now, Jane, I think you have read quite enough to be good for your lungs; give this letter over to Dora, who must commence by marching me off about one o'clock the morning of the 15th. Nothing particular occurred until our arrival at Ocana, where the English woman, Madame Chasse, sent for me to give me a little cold meat. I must not forget to tell you that her General called on me the day before when I was out at dinner and left his card, which I shall enclose. We remained at this place about an hour, just time enough for the troops to plunder the town, and then marched on for the town

of Villa Tobas, which place we reached about four o'clock in the evening. I then saw General D'Armagnac and asked if he had spoken for me; he said he had not been able to see the Marshal, Jourdan. Then thinks I to myself, "I wish I was quite well enough, I would try to make my escape to-night;" for I knew the Major, who was a great brute and the only uncivil officer I had met with, dined out that day. I made the driver officer half drunk and we had a very pleasant evening and I went to bed about 11 o'clock. We marched again the next morning, the 16th, at two o'clock; but before I tell you about this I must give you a short description of this said Major who had charge of me. He lived exceedingly well, for this reason that his servants stole everything they could lay their hands on, and his men were obliged to bring a fourth of everything they stole to him, so that in fact he was over-stocked. But anything he had of his own he never offered me; claret for instance, he always had the bottle on the ground by his side and never once offered me a drop. He drank coffee frequently and never gave me any. He saw me one day cutting one of my handkerchiefs in two to serve as a towel and night-cap for Morgan and myself, and though he had 50 towels he never offered me one, soap the same; I had not a bit the whole time I was with him and he never offered me any.

Well, we started at two o'clock a.m. for Corral de Almaguer, which we reached at two p.m. I found myself so much better that I was determined on making my escape that night, and I took particular notice the whole way I came how the land lay. I thought a hill about four miles from the place where we were going to halt seemed very much to favour my plan. When we halted, the General told me he had not been able to see the Marshal. Shortly after, General Chasse sent for me to give me something to eat, and I mentioned to him that I was trying for an exchange, as the state of my health was such, it would prevent the possibility of my going much further. He said he would do anything for me, but the lady added that Jourdan was a great beast, and turning to me said, "I hope you are not married." I found that was her soft side, and said "No, I am not," but added "that I was going to be the instant I returned to England."—"Dear me, how very unfortunate; may I ask to whom, perhaps I may know the name." Without the smallest hesitation I said to Miss Gosling, the great banker's daughter. "Oh dear me, I remember Banker Gosling's name perfectly well." I thought how B—— would have laughed could she have heard this neat little fabrication. However, it answered exceedingly well, for she promised to do everything she could for me, and in the event of my going to Paris, she would give me a letter to the Minister of War to forward my exchange, but as I found myself so much better I preferred to risk the chance of my escape to taking my parole.

Morgan and I kept a good lookout the whole day to see how they occupied the ground between us and the hill. We were sitting together planning the business when we were witnesses to a most extraordinary circumstance. One of their German infantry regiments was drawn up in line. Shortly after, a cavalry regiment, the

regiment of Nassau, came up and wished to pass through them; this the infantry refused, but finding the cavalry seemed determined, they fired two or three muskets and came down to the charge; the leading squadron immediately formed and charged them. General D'Armagnac immediately rode up and separated them, but not until several men had been killed and wounded. He instantly sent both regiments out on picquet, the cavalry to our rear, the infantry to the front; this you may suppose was rather against our escape, but we had made up our minds to go off, and that was enough. Well, having dined, I sent Morgan out to get a little straw for our bed, which we made and laid down our blankets and placed each of our helmets at the head. This being done, we wished each other well, agreeing we were to meet about 30 yards in front of the artillery park. I must tell you that the sun had gone down, but the moon was not up, and there was a sort of mist between both. He then went to the right and I to the left, walking unconcernedly through everybody until I came about 10 yards to the front, when a soldier called out to me to know if I knew where the cavalry were. I said "No" and he gave me a blessing to himself and went on; and I proceeded and joined Morgan.

Now, Dora, give this scrawl over to Miss Kate, and let her help me with the difficulty of my escape, which she must do by setting us off running arm in arm as hard as we could go over the ploughed ground, which we kept up for nearly 500 yards, when Morgan discovered two vedettes about 50 yards ahead of us. We threw ourselves down upon our faces directly; after lying there a few seconds we discovered one of the vedettes to be only a clod of earth, and the other had passed on. Up we got and ran on again as long as we could go, crossing a ditch full of rushes up to our knees in mud; this we thought a pretty good check for any cavalry that might come in pursuit of us. We then made a stop, when we heard the cavalry bugle sound the "turn-out," and off we set again until we could scarce run any longer, when Morgan said "I hear them galloping." At this time I could run no longer, but he pulled me along for about 300 yards further, when we listened again the poor fellow said: "I beg your pardon, sir, it was only my heart beating that I heard." We then went on gently until we came to the hill and, having got half up it, we crept into a bush about three feet high, and remained there the whole of that night. Morgan got a good nap, but I was afraid to shut more than one eye at a time, fearing from the state my mind was in I might talk in my sleep.

Day appearing on the morning of the 17th, we saw the troops marching off, having heard the drums beating to arms for near two hours before. The whole of the troops, baggage, etc. having marched, we were rather astonished to hear the drums still beating, and about an hour after this we saw their rear-guard of cavalry come along the road and form up outside the town, from which we were at least four miles distant. Shortly after the remaining infantry marched out and the whole cavalry followed. We still lay there about an hour longer when we saw a peasant going past. I sent Morgan down to speak to him and he turned out to be a miserable little fan-maker whom the French had taken on by way of a guide. He was at first frightened

out of his life when Morgan spoke to him, but finding we were English prisoners escaped from the French, he was delighted and came up immediately and told me it was certainly the rear-guard of the French army I had seen leave the town. I then consulted with him as to the best and most secure road for getting to Madrid, which he said was certainly by Lillo; so off we set to walk to the said town about 10 English miles. The day was as hot as ever came out of the heavens! Having got within sight of the town I was determined to lie up in the bushes until I had sent the little fellow on to see if the town was clear, when just at that moment I discovered troops marching out of the town. I was by this time so beat I could not go a yard farther, and I got into a small hut belonging to a man who was guarding his melons. The first question I asked him was, whether he had seen anything of the French? "Yes, they have been gone out of this house about half-an-hour."—"Do you know of any more coming?"—"Yes, they told me there was another division coming, but I can't say for certain." It was immaterial to me whether they came or not, for out of their way I could not get, and I laid myself down and got two or three hours very good sleep. When I awoke I sent a man into the town to purchase something to eat. He came back in about an hour bringing some bread and *aquardente* (brandy), of which I made a hearty meal. As soon as the sun had gone down (about seven o'clock), I went into the town where I was received by all the inhabitants with open arms and "*Viva les Engleses, viva, viva.*" I applied to the alcalde (the magistrate) for a carriage, but none was to be had, so he furnished me with three donkeys, on which Morgan, the little fan-maker and I mounted, having three men to follow us on foot. As I told you I left my helmet behind me. I, of course, entered the town with a half handkerchief on my head; on seeing which, one of the people furnished me with a very large cocked hat. As I was going out of the town and pulling my hat off to the multitude, who were *viva-ing* me, my donkey took fright, turned directly round and over his head I went. As soon as I had got out of the town I gave the little fellow my hat to carry, and he went and looked into a well to see if there was any water and down went my fine hat.

To proceed: we travelled on until about two o'clock when we found ourselves too tired to go on any longer, so we got off our nags, and lay down on the road. Having had an hour's sleep we proceeded and reached Ocana about six o'clock the morning of the 18th, when we had to go through the same form of *viva-ing*, with this addition that a man came to ask me to step into his house. When I had been seated but a few seconds, he asked me if I would allow the inhabitants to see me, for they had never seen an Englishman. I of course said "yes," and Morgan and I having seated ourselves in two large chairs, in came at least 100 people. As soon as they were satisfied in came as many more, and so on until the whole town had seen us. Then we mounted our fresh donkeys and set off for Aranjuez, where we had to undergo the same form of sitting to be seen. At Aranjuez we got fresh mules and rode on 3½ leagues further to Valdemoro. Poor Morgan knocked up half way, and I left him behind to come on gently with a man while I

went on into the town, ordered a cart to be in readiness when he arrived to convey him further, and had a horse prepared for myself. As soon as he came in and was a little refreshed I set him off again, and went on before, arriving in this place about six o'clock. I went immediately to Colonel Robe,[1] but he had gone out to dinner and none of his servants knew where he was to be found.

Now, my dearest mother, take the letter from Kate, and introduce me to his Lordship, who was sitting in the palace by himself. Colonel Gordon took me to him. He was exceedingly glad to see me, got a chair, and seated me close by him. "Bye-the-bye," said his Lordship, "you cannot have had anything to eat lately; order dinner directly for him and see that he has a comfortable bed for he should be put to bed instantly, he appears so much fatigued." I said if his Lordship would allow me to ask for some tea I should prefer it to dinner. He said "certainly," and ordered it. He then entered into conversation, and I told him everything I knew as to the enemy's strength, their route, etc. This being finished, he said he was going to send letters to England, and desired me to go into his Secretary's room, and let my friends know I had returned; in fact, nothing could have been kinder than he was, and his manner at once shewed me he was not displeased with our conduct.[2] I left him and got my tea most comfortably, and learning that my baggage was all in Harding's quarters, I preferred going home to sleeping in the State bed. Mr. Reed came to fetch me with the horses and I rode home where I found our Doctor and the Commissary sitting together. They were astonished beyond all idea at seeing me, but most happy; poor Harding had been dining out but came directly and was really too much affected to say how glad he was to see me. Newland also seemed most happy to see me, as did all the servants, who came running in and burst into tears and so far forgot themselves in their joy, that I thought they would never have done shaking hands with me. These demonstrations were no sooner over than in came the new Sergeant-Major[3] and non-commissioned officers to wish me joy of my escape, and told me before they left the barracks, the troop had drunk my health in a bumper with three times three. The officers told me that when they were going over the hospital in my absence and enquiring of the poor wounded fellows how they were getting on, they said "better," but if they could get Captain Dyneley back they should do "well." All this part I mention because I am sure it will gratify you all as much as it did me. I must not forget my friend Bob Douglas, whose joy could not be suppressed; they say your friends should lose you to know how much you are liked; this I experienced to the full extent, for I sat up in state the three first days to receive them, and they flocked in by dozens all day long, and since then I have had them from all parts to congratulate me on my escape.

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[1] Kane's List, No. 654.

[2] Lord Wellington in his despatch from Madrid, August 13th, says, "The conduct of the brave German cavalry was, I understand, excellent, as well as that of Captain Macdonald's troop of Horse Artillery.

The casualties were: killed 53, wounded 98, missing 44.

Lord Wellington sent a French Captain of artillery back to their army in exchange for Captain Dyneley, and gave him under his own hand a regular exchange.—Ed.

[3] 1st Staff-Sergeant Charles Banies.

Now I must thank you all most kindly for your letters up to the 25th July, all of which were put into my hands the night of my arrival. Part of Robert's is a curious coincidence as it happened. He tells me not to part with "Bobby" for 500 dollars as I should be ready to hang myself if I were taken prisoner in consequence of it, which might well be. Now it so happened that the day before my capture, Bobby picked up a nail, and was so lame I could not ride him, and for that day, the first since my arrival in the country, I was on the back of a trooper, or I certainly should not have been taken. I should of course have stopped when the gun upset, but when I found the enemy coming so close upon me, I should, had I been on Bobby, have gone away and of course saved the "detachment" from falling into the enemy's hands. The first idea that struck me after I was taken was that you would think I had been doing something foolish and had got trapped; but the first part of my letter will set you right on that head. I assure you the only anxiety I had upon the occasion was the dread of your having the news and not knowing what had happened to me. However, I sent to Harding the next morning to desire he would write and let you all know that I was safe, which I find he was good enough to do.

A very extraordinary circumstance happened to me with respect to a dog. When at Castello Branco, I found a very pretty little terrier which took a fancy to me, but was scarce ever with me except at dinner. If I rode out he would go with me, but was so wild that he was seldom in sight, though he would return home with me. I never noticed him much, however, and indeed have often given him a thump at dinner for his ingratitude instead of a bit of meat. He went into the field with me the evening of the 11th, and when I got my fall I found him waiting for me, and he never was an inch from me during the whole of the two days I was marching, although the Frenchmen were constantly kicking him. When I was put into the waggon, his anxiety to get to me was so great, that in jumping up he was knocked down and run over, but as he had no bones broken I carried him a day or two and he recovered. The night I left I was obliged to entice him to lie down on my bed with my helmet, and when he was asleep I ran away and left him. You may suppose what I felt at leaving him, but what could I do? if they had come in search of me and I was in the bush, he would have barked and I should have been discovered.

I only blame myself for one thing, which was not having directed the letter I wrote you to Mr. Freeling. I intended the whole time I was writing to have put his name on your envelope that he might have announced to you my return, but there were so many people round me I knew not what I was about.

Tell Eyre, Johnny Raw acquitted himself remarkably well on that day, for as soon as Reed had given me my horse, he set off at speed into the town just as the French entered it. Almost everybody lost the whole of their baggage. Newland, Robe and our troop lost every stitch, Harding lost a part, my only loss, besides what they took from my person, was four shirts, for the washer-woman lost her kit.

Now for my wants, tell Dubois & Wheeler to set to work imme-

diately and make me a watch exactly the same as my last, excepting the stop-hand, which must be in front of the watch; having to open the watch behind to stop it was very inconvenient. Tell them to let it be as good as the last and I shall be contented, for a better watch was never carried than the scoundrels took from me. I wrote to you from the camp, but you have not got the letter, telling you I was well and wishing you would ask Miss Scott if she would speak a good word for me to my only stand-by, her father, in case anything could be done for me to get an exchange on my arrival in France. I cannot say much about a trophy for her this time; a shrubbery of laurels were within our reach if those cowardly scoundrels of Portuguese would have stood by us. Most happy should I be to meet the same party in half-an-hour with 200 swords short of the number we had, but it should be English and German blood, no Portuguese.

I shall want directly a sword and sabretasche complete; tell Hawkes to let the sabretasche be of his last pattern, with ink-stand, lock and key, etc. with two knots. The sword must be the light dress Horse Artillery, the others are too heavy for me. I wish you would let him be paid, he has written to me for his money, as you will see by my letter.

It is now the 25th. I have only been once out of my room since my return and that was to dine with Robe the day before yesterday. I have had some hundred invitations, but I refuse them all, though I certainly never was better in my life. The weather is dreadfully hot. I am up every morning at the peep of day and get plenty of air by walking about the house, which is very large and exceedingly comfortable. Madrid has one of the finest markets in the world and I have plenty of money. Now, my dearest mother, what would you wish me to have more?

I think now, having filled the 40th side of paper, I have kept you all quite long enough. I will give you a few lines by the next packet, that is to say if I am within reach of head-quarters, but at present a move is talked of. Joseph, we cannot follow, he must be in Valencia by this time, but Marshal Marmont wants another dressing it appears. I forgot to mention Reed poor fellow; he was very much annoyed to hear I was gone, he told Harding he should not have cared if he had been taken too.

The enclosed cards are of people who have called upon me since my return to enquire if I knew anything of their families who had gone away with King José. I saw 500 carriages marching with him, most of them belonging to gentlemen who found themselves obliged to quit Madrid with their families, and when I left they were nearly all starving to death. I hope you will admire their cards; I think Mr. Brook in the Strand should see them.

Remember me kindly to General Mcleod, tell him I hope he thinks the "corps of communication and observation" have cut a dash. Ask him to answer my letter of the 9th. I thought of him when I was communicating with General D'Armagnac.

(To be continued).

AN EXAMINATION OF THE R.A. SENIORITY

AND

DISTRIBUTION LISTS FOR MARCH 1896.

BY

LIEUTENANT H. L. GRIFFIN, R.A.

Looking through this list it occurred to me that a sort of "statistical *résumé*" thereof might be of interest to the Regiment. I have therefore ventured to compile the following facts and have checked everything twice, but where the references have been so numerous and varied, it is hardly possible to say that absolute accuracy in every figure has been obtained.

It should be clearly understood that I have taken all names as given in the March 1896 list of the R.A. Institution, taking no notice of any promotions, retirements, &c. that have taken place since its issue.

Composition and distribution.

(1.) The Royal Regiment of Artillery consists of 1926 officers, viz. :—

2 Field-Marshals (including H.R.H. the Colonel-in-Chief).
31 Colonels-Commdt. (including Sir R. Biddulph on active list).
6 General Officers (unemployed supernumerary list).
23 „ „ on active list.
32 Colonels (employed).
15 „ (unemployed).
84 Lieut.-Colonels on full pay.
24 „ employed on staff, &c.
2 „ on half-pay.
278 Majors.
475 Captains.
616 Lieutenants.
214 2nd Lieutenants.
44 District Officers (4 majors, 11 captains, 29 lieutenants).
24 Inspectors of Ordnance Machinery (3 captains, 21 lieutenants.
19 Riding-Masters (1 hon. major, 9 hon. captains, 9 hon. lieutenants).
37 Quarter-Masters (2 hon. majors, 10 hon. captains, 25 hon. lieutenants).

These 1926 officers are distributed as follows :—

On the Staff of the Army	187
Royal Horse Artillery (including 3 Cols.-Commdts.) ...	140
Field Artillery	476
Mountain Artillery	54
Garrison Artillery	618
Emergent Detachments	4
District Staff	7
Unposted	16
Native and local artillery	70
Adjutants of Militia (not acting as adjutants of depôts)	24
Adjutants of Volunteers	63
Quarter-Masters of Militia	20
Indian Ordnance Department	59
Employed (but not on the staff of the army)	128
Colonels-Commdt. and General Officers (not on staff) ...	43
Unemployed Officers (not General Officers)	17
Total	1926

Staff employ

(2.) Employed on the staff of the army, including Regimental Colonels-on-the-Staff and their respective D.-A.-A.-Gs., Brigade-Majors or Staff Captains, there are 187 R.A. officers, made up of—

16 General Officers,
32 Colonels,
18 Lieut.-Colonels,
36 Majors,
75 Captains,
10 Lieutenants.

Total 187 or roughly 10 per cent.

Orders.

(3.) The following hold English Orders :—

K.G.	(1)	H.R.H. the Colonel-in-Chief.
K.T.	(1)	„ „ „
K.P.	(1)	„ „ „
V.C.	(3)	Field-Marshal Lord Roberts, General Sir C. Dickson, General Sir W. Olpherts.
G.C.B.	(7)	H.R.H. the Colonel-in-Chief, Generals Sir C. Dickson, Sir C. D'Aguilar, Sir J. Adye, Sir M. Biddulph, Sir C. Arbuthnot, Field-Marshal Lord Roberts.
G.C.M.G.	(2)	H.R.H. the Colonel-in-Chief, General Sir R. Biddulph.
G.C.S.I.	(2)	„ „ Field-Marshal Lord Roberts.
G.C.I.E.	(2)	„ „ „

K.C.B. (9) Generals Sir D. Fraser, Sir H. Brackenbury, Sir W. Stirling, Sir H. Alderson, Sir J. Abbott, Sir W. Olpherts, Sir R. Cadell, Sir A. Kemball, Lieut.-Colonel Sir A. J. Bigge.
K.C.M.G. (1) General Sir H. Smyth.
K.C.S.I. (2) Generals Sir H. Brackenbury, Sir A. Kemball.
K.C.I.E. Nil.
C.B. (33) Generals Gardiner, Yates, E. A. Williams, Pipon, R. Biddulph, Goodenough, Geary, Harness, Alleyne, Maurice, Lloyd; Colonels Stewart, Yeatman-Biggs, Turner, J. Slade, Elles, F. Slade, H. Morgan, Broadfoot, Martin, Aitken, Knox, Watkin; Major and Colonel Wodehouse; Captain and Bt. Major Wingate; Generals Carleton, Chapman, Nairne, Cowie, Ward, Swinley, Pearse and Caldecott.
C.M.G. (3) Colonels French, Sir A. Bigge, Wodehouse.
C.S.I. (2) Generals Sir H. Thuillier, A. Walker.
C.I.E. Nil.
D.S.O. (15) Majors E. C. Wace, Mansel, O. Smyth, Shirres, Keene, Major and Colonel Rundle, Major Triscott, Captain Fendall, Bt. Major Wingate, H. E. Stanton, Coxhead, Merriman, East, Lieutenants C. G. Stewart, MacMunn.

(4.) The following have received special promotion at some period of their service to the undermentioned ranks:— Special promotion.

Field-Marshal	Lord Roberts.
General	Lord Roberts.
Major-General	Sir H. Brackenbury.
Colonel	Lieut.-General E. F. Chapman; Major-Generals S. J. Nicholson, Alleyne, Maurice; Cols. R. Stewart, J. Slade.

(5.) The following have received at some period of their service brevet promotion for service in the field:— Brevets.

Sir M. Biddulph—Major and Lieut.-Colonel (Crimea).
Sir C. D'Aguilar—Major (Crimea), Lieut.-Colonel (Indian Mutiny).
Sir D. Fraser „ „ „ „
General Yates „ „ „ „
General Pipon—Major (Crimea).
Sir C. Arbuthnot „ „
General Hastings „ „
Sir R. Biddulph „ (China), „ „ (and China).
Sir H. Brackenbury—Major (Ashanti), Lieut.-Colonel (Natal).
General Goodenough „ (Indian Mutiny).
Sir W. Stirling—Major (Indian Mutiny), Lieut.-Colonel (General Service).

General Forster—Major and Lieut.-Colonel (New Zealand).
„ Nicholls—Lieut.-Colonel (Perak).
General Geary—Major (Abyssinia), Lieut.-Colonel (General Service).
„ Owen—Lieut.-Colonel (South Africa).
„ Harness „ „
„ Hazlerigg „ (Afghanistan).
„ Alleyne—Major (South Africa), Lieut.-Colonel (Egypt),
„ Maurice „ „ „ „
Sir J. Abbott „ (Hazara Expedition 1849).
General Carleton—Lieut.-Colonel (Indian Mutiny).
Sir W. Olpherts—Major and Lieut.-Colonel (Indian Mutiny).
Lord Roberts—Major (Indian Mutiny), Lieut.-Colonel (Abyssinia).
General Chapman—Lieut.-Colonel (Afghanistan).
„ Cowie „ „
„ Swinley—Major and Lieut.-Colonel (Afghanistan).
Sir R. Cadell—Lieutenant-Colonel (Indian Mutiny).
General Pearse—Major „
Sir A Kemball „ (Persia).
General Aitken „ (Indian Mutiny).
„ Caldecott—Lieutenant-Colonel (Afghanistan).
Colonel Holley „ (Egypt).
„ Stewart—Major (Afghanistan), Lieutenant-Colonel (Egypt).
„ Yeatman-Biggs—Major (South Africa), „ „
„ F. Slade „ and „ „
„ Wodehouse „ „ „ „
„ Rundle „ „ „ „
„ Pretyman „ „ „ (Afghanistan).
„ F. T. Lloyd (Major-General) „ (Egypt).
„ Turner—Lieutenant-Colonel (Egypt).
„ Elles—Major (Egypt), Lieutenant-Colonel (Hazara Expedition).
„ Hunter—Lieutenant-Colonel (Egypt).
„ J. Slade—Major (Afghanistan).
„ Creagh „ and Lieutenant-Colonel (Egypt).
„ R. Wace „ (Afghanistan).
Lieut.-Col. H. Morgan—Major (Afghanistan), Lieutenant-Colonel (Hazara Expedition).
„ Corbett „ „
„ Aitken—Lieutenant-Colonel (Burmah).
„ Broadfoot—Major (Afghanistan).
„ Yates—Lieutenant-Colonel (Burmah).
Major and Lieut.-Col. Cunningham—Lieutenant-Colonel (Chitral).
„ „ Grierson „ (Egypt and Burmah).
„ „ Adye—Major (Egypt), Lieutenant-Colonel (General Service).
Lieut.-Col. Martin „ „
„ Hay „ „

Lieut.-Col.	Lugard	„	(Afghan).
„	Knox	„	(South Africa).
Major	Rochfort	„	(Egypt).
„	Saunders	„	(Burmah).
„	Cowan	„	(Egypt).
„	C. Parsons	„	„
„	Sclater	„	„
„	Norton	„	„
„	Anderson	„	„
Capt. and Brevet-Major		Kemball—Major	(Chitral).
„	„	F. H. Birch „	(Waziristan).
„	„	Wingate „	(Egypt).

Qualified Staff.

(6.) Twelve officers are on the list of the "Qualified Staff," viz.: Major-General Alleyne; Colonels Yeatman-Biggs, Turner, J. Slade, F. Slade, Pearson, Yates, Rundle; Majors Saunders, Sclater, Triscott, and Wingate.

Distinguished service rewards.

(7.) Thirty-five officers are or have been in possession of "Distinguished Service" Rewards, viz.: Generals Sir C. Dickson, Askwith, Sir C. D'Aguilar, Sir J. Adye, Gardiner, Sir M. Biddulph, Radcliffe, Sir D. Fraser, Yates, Williams, Pipon, Sir C. Arbuthnot, Hastings, Sir H. Smyth, Leslie, Sir R. Biddulph, Sir H. Brackenbury, Goodenough, Sir W. Stirling, Forster, Geary, Sir J. Abbott, Sir H. Thuillier, Sir W. Olpherts, Cordner, Sir W. Stirling-Hamilton, Lord Roberts, Chapman, Nairne, Cowie, Sir R. Cadell, Pearse, Kerrich, McLeod, Aitken.

Military Attachés.

(8.) Two officers hold the appointment of Military Attaché at foreign embassies: Major and Lieut.-Colonel J. M. Grierson at Berlin, and Major Waters at St. Petersburg: while Colonel J. Slade has only recently given up this appointment at Rome, and similar appointments have been held by Generals Sir H. Brackenbury and Goodenough at Paris and Vienna respectively, Sir C. Dickson at Constantinople and Sir A. Kemball.

A.D.C's.

(9.) Three officers, viz.: H.R.H. the Colonel-in-Chief, Colonels R. Stewart and J. Slade are A.D.C's. to Her Majesty; whilst Generals Sir C. Dickson and E. F. Chapman have also had this honour.

Royal Household.

(10.) Three officers: General Gardiner, Sir M. Biddulph and Lieut.-Colonel Sir A. Bigge hold appointments connected with Her Majesty's household, and Riding-Master J. Nicholas is Superintendent of the Royal Mews at Buckingham Palace.

Humane Society.

(11.) Seven officers hold medals from the Royal Humane Society for saving life, viz:—

Silver—Sir M. Biddulph, General Le Cocq; Major Hunt, Captain Hardy.

Bronze—Captain S. D. Browne, Major Rich, Captain Logan.

Commands.

(12.) Field-Marshal Lord Roberts and Generals Goodenough, Geary, Maurice and Nairne command Army Districts; Cols. Yeatman-

Biggs and Elles command Brigades in India, and Major-General Swinley commands at Sialkote.

Interpreterships. (13.) The following have obtained interpreterships in the different languages :—

French (17) Lieutenant Budworth, Colonel Chapman, Captain Bethell, Lieutenant Earle, Major Porteous, Lieutenant M'Kay, Lieutenant M'Culloch, Captain M. C. Maunsell, Lieutenant Vereker, Major Inglefield, Lieut.-Colonel Grierson, Major Trench, Major Waters, Captain Macbean, Lieutenant Fraser, Captain Fasson, Captain Granet.

German (11) Captain C. Callwell, Lieutenant Earle, Captain A. S. Dunlop, Lieutenant H. Roberts, Lieut.-Colonel Grierson, Majors Trench and Waters, Captains Fairholme, Macbean and M. Roberts, Lieutenant Wingfield.

Russian (5) Lieut.-Colonel Grierson, Majors J. W. Murray and Waters, Captains Burrowes and Furse.

Spanish (1) Lieutenant M'Kay.

Italian (1) Captain Granet.

Arabic (3) Majors Whitehorne and J. W. Murray, Captain Burrowes.

Turkish (4) Colonel Clayton, Majors J. W. Murray, W. H. Williams, Wingate.

Gold Medal R.U.S.I. (14.) Five officers have won the Gold Medal of the United Service Institution, viz.: Colonels Clayton, Trotter, Major Elmslie, Captains C. Callwell, G. E. Benson.

Although this is probably the most difficult distinction of all to obtain, there is nothing in the Institution list to show that these officers have won it.

R.A.I. Medals. (15.) Ten officers have won the Gold Medal of the R.A. Institution, viz :—General Sir H. Smyth *twice* (but this is not shown in the R.A. list); Colonels Clayton, A. W. White, Trotter, Jocelyn; Majors A. M. Murray, Elmslie, Keir, Stone, W. L. White.

Eight officers have won the Silver Medal of the R.A. Institution, viz:— Colonels Elles, A. W. White, Rainsford-Hannay *twice*, (but this is not shown in the R.A. list); Majors R. F. Johnson, A. M. Murray, Stone, W. White, Nicholls.

Staff College (16.) Sixty-seven officers have passed the Staff College, viz :—

Generals Yates, Nicholls, Maurice, Chapman.

Colonels Hutchinson, Knollys, Clayton, Walford, Jones, Elles, Wynne, A. G. Walker, Bury, Crookenden, Daniell, W. M. Smith, Dalton, Hammond, Montgomery, Trotter, Fawkes, Jocelyn, Creagh, Adye, Grierson.

Majors Spence, H. C. Walker, J. W. Murray, Johnson, Barker, Jeffreys, Fletcher, Hawkins, Baldock, Waldron, Cowan, Fleming, Dunlop, Kerrison, Smith, Waters, Inglefield, Dawkins, Keir, Trench, Stone, White.

(16.) *Captains* C. Callwell, Granet, Kemball, F. E. Cooper, Hume, Fairholme, Chance, Stuart, G. D. Baker, Hamilton-Gordon, P. Crampton, Benson, Du Boulay, Churchill, J. G. Dawkins, Montgomery, Crawford, H. Stanton, J. F. Cadell, Macbean.

(17.) 50 officers have passed the advanced class :— Advanced Class

General Owen.

Colonels Walkey, Morley, Bainbridge, Wynne, A. White, Hunter, Anstruther, Macgregor, Harman, Watson, Blandy, Standbridge, Lockyer, Jocelyn, Dawson.

Majors Elwes, Macmahon, E. Ward, Penton, Rigg, Hadden, Brett, Kelaart, Boteler, Urquhart, Townshend, Leach, Downing, Acton, Turner, Foster.

Captains Bushe, Mahon, A. Lambart, Lane, E. Lambert, Nathan, H. Barlow, Meeres, Wolley-Dod, Heffernan, Guille, Adair, Waring, Fisher, Farmar, Randolph, Rolt, J. Mansell.

(18.) 2 officers have won the Lefroy Gold Medal :—Captains Bushe and J. Mansell. Lefroy Gold Medal.

(19.) 324 officers have been through the Long Course. Courses.
132 ,, ,, ,, ,, Range-Finding ,,
108 ,, ,, ,, ,, Veterinary ,,
117 ,, ,, ,, ,, Signalling ,,
68 ,, ,, ,, ,, Firemaster's ,,
44 ,, ,, done the Steam and Electricity ,,
43 ,, ,, ,, ,, Position-Finding ,,

(20.) Only 17 officers are now on the list who served in the Crimea viz :—Generals Sir C. Dickson, Sir M. Biddulph, Sir C. D'Aguilar, Sir J. Adye, Sir D. Fraser, Yates, Johnson, Pipon, Sir C. Arbuthnot, Hastings, Sir H. Smyth, Sir R. Biddulph, Sir W. Stirling, Markham, Nicholls, Geary, Sir H. Alderson. Crimea.

(21.) The best decorated officers in the Regiment are :— Decorations

(1.) General Sir J. Adye—8 decorations; Grand Cross Medjideh; G.C.B.
(2.) Field-Marshal Lord Roberts—5 decorations; G.C.B., G.C.S.I., G.C.I.E. and V.C.
(3). General Sir C. Dickson—7 decorations, G.C.B. and V.C.
(4.) Sir H. Brackenbury—7 decorations, K.C.B., K.C.S.I.
(5.) Colonel Wodehouse—8 decorations.
(6.) General Sir R. Biddulph—6 decorations and G.C.M.G.
(7.) General Sir W. Stirling—6 decorations and K.C.B.

Major-General Maurice, Colonel F. Slade, Colonel Rundle and Major Wingate have 6 decorations each.

(Foreign Orders and Companionships of English Orders have been counted as decorations).

(22.) During the last five years promotion has run as follows (taking from 1st March, 1891 to the March list, 1896.) Promotions.

LIEUTENANTS TO CAPTAINS.

YEAR.	NUMBER PROMOTED.	AVERAGE SERVICE.
1891-2	63	$9\frac{3}{12}$ years
1892-3	44	$9\frac{2}{12}$,,
1893-4	42	$9\frac{1}{3}$,,
1894-5	21	$9\frac{9}{12}$,,
1895-6	49	$10\frac{3}{12}$,,

CAPTAINS TO MAJOR.

YEAR.	NUMBER PROMOTED.	AVERAGE SERVICE.
1891-2	36	$17\frac{6}{12}$ years
1892-3	36	$16\frac{11}{12}$,,
1893-4	24	$17\frac{6}{12}$,,
1894-5	15	$17\frac{6}{12}$,,
1895-6	33	$18\frac{8}{12}$,,

MAJOR TO LIEUTENANT-COLONEL (IGNORING HALF-PAY PROMOTION.)

YEAR.	NUMBER PROMOTED.	AVERAGE SERVICE.
1891-2	23	$27\frac{6}{12}$ years
1892-3	18	$27\frac{4}{12}$,,
1893-4	14	$27\frac{5}{14}$,,
1894-5	14	27 (almost)
1895-6	14	$26\frac{8}{12}$ years

A few facts.

(23.) The Riding-Master with most service, both in the ranks and commissioned, is Major Donnelly with 40 years. The Quarter-Master with most service is Major Murdoch with $40\frac{1}{4}$ years.

Out of 19 Riding-Masters, no less than 9 have the initial 'J' only, and 5 of these come consecutively.

Sir H. Brackenbury became a Major-General in less than 30 years.
Lord Roberts became a Major-General in less than 27 years.
The quickest promotion to the rank of Colonel is—

Colonel Rundle in $17\frac{5}{12}$ years, age 38.
followed by Colonel F. Slade in $17\frac{7}{12}$ years, age $37\frac{7}{12}$
and Colonel Wodehouse in $17\frac{5}{12}$ years, age $37\frac{5}{12}$

The oldest officer in the Regiment is Sir J. Abbott, born March 12th, 1807. General Abbott received his 1st commission in June, 1823, nearly 73 years ago.

His length of service will be best understood perhaps by a few comparisons.

(1.) He had 6 years service before any officer (except Field-Marshals) on the active list of the British Army was *born*.

(2.) Out of 31 Colonels-Commandts. in the Regiment no less than 18 were not *born* when General Abbott got his commission.

(3.) When I was in South Africa in 1888 my then Major (Colonel R. F. Williams) got his commission 2 years before I was born. The General there (Sir H. Smyth) got his commission the same year Colonel Williams was born, but General Abbott had his commission $2\frac{1}{2}$ years before General Sir H. Smyth was born!

There are 7 Colonels-Commandant on the Bengal List, their average service is well over $57\frac{1}{2}$ years!

General Sir J. Abbott served at the siege and capture of Bhurtpore in 1825–6, over 70 years ago.

Generals Askwith and Sir C. Dickson were in action in Spain in 1833, as also General Gardiner in the Canadian Rebellion in 1838.

The youngest officer, according to the Alphabetical List for January quarter, 1896, is 2nd Lieutenant H. W. Gardiner, born on December 26th, 1875.

SHRAPNEL FIRE OF FIELD ARTILLERY.

BY

COLONEL E. BAINBRIDGE & CAPTAIN H. B. STRANGE.

Section (1.) Introduction.

Colonel Walford's translation of Major-General Rohne's essay on Shrapnel Fire of Field Artillery, lately published by the Royal Artillery Institution, naturally causes inquiry as to how our shrapnel shell compares in its effect with the shrapnel dealt with by the General. The object of this article is to draw such a comparison between the English 15-pr. Mark II. shrapnel, the 12½-pr. Mark II., and the German and ideal shrapnels of General Rohne, working out the effect by the formula given in his essay.

(2.) Particulars of shrapnel. Number of bullets, etc.

The 15-pr. shrapnel, Mark II.—

Weight 14 lb. Number of bullets 35 to the lb., 200.

The 12-pr. shrapnel, Mark II.—

Weight 12½ lb. Number of bullets 35 to the lb., 150.

The German shrapnel—

Weight 15½ lb. Number of bullets 41 to the lb., 300.

Example—Page 15 of Essay.

(3.) Examples showing comparative effect of the British and German shells on various targets, the distances from "point of burst" to target being the same for each description of shell.

To find number of hits per round from above shrapnel, the range being 2,187 yards, and the distance of burst 54 yards short of that target which is 11 yards wide and 2 yards high.

15.-Pr. Shrapnel.

$$\text{Density of hits} = \frac{200}{(54 \tan 5°)^2 \pi} = 2{\cdot}8 \text{ hits per square yard of target.}$$

The width of the target covered at 54 yards, angle of opening 10°, is 10 yards. Therefore area of target attacked is 20 square yards. The number of hits per round will be $2{\cdot}8 \times 20 = 56$, as compared with 20 for the German shell. By doubling the width of the target, the English shell remains 56, and the German highest possible is 37 hits.

The 12-pr. Mark II. shell has an angle of opening identical with the 15-pr. Mark II., but only contains 150 bullets. The number of hits will, therefore, be $\frac{3}{4}$ of those obtained with the 15-pr., viz. 42. This is still much superior to the German shell.

Example—Page 17 of Essay.

How many hits may we expect to make at 1,093 and 2,187 yards when firing at a line of skirmishers lying down, each man occupying a front of 0·875 yards, with distances of burst of 54, 109, 164, 218, and 273 yards from target? 15-pr., 12-pr. and German shell.

(1). At 1,093 Yards.

The angle of opening of English shell is 8°, the spread of the bullets with a distance of burst of 54 yards is 7·5 yards. In this width eight men can lie, giving a target area of $8 \times \cdot15 = 1\cdot2$ square yards. The density of hits = 4·4 for the 15-pr.; therefore the number of hits to be expected is $4\cdot4 \times 1\cdot2 = 5\cdot28$ per round. That is supposing no man to be hit with more than one bullet, the German would kill or wound three and three-quarter men among 20, while our shell would kill or wound five and a quarter men among 7; the latter result would seem to be much the most demoralizing in its effect.

Following up the example we get—

	Hits per round.		
	15-pr. Mark II.	12-pr. Mark II.	German.
54 yards burst	5·28	3·96	3·75
109 „ „	2·64	1·98	1·87
164 „ „	1·76	1·32	1·25
218 „ „	1·32	0·99	0·94
273 „ „	1·05	0·78	0.75
327 „ „	0·88	—	—

adding another 54 yards makes the distance of burst 327 yards, and we still obtain a better effect with our 15-pr. than the German shell at 273 yards. This is a decided advantage, considering the waywardness of time fuzes.

(2). At 2,187 Yards.

Distance of burst 54 yards; angle of opening 10°; spread of bullets 10 yards. In this space 12 skirmishers could lie, giving a target of $12 \times \cdot15 = 1\cdot8$ square yards. The density of hits of 15-pr. is $2 \times 1\cdot3 = 2\cdot6$, therefore the total number of hits will be 4·68 per round.

	Hits per round.		
	15-pr. Mark II.	12-pr. Mark II.	German
54 yards burst	4·68	3·51	3·14
109 „ „	2·34	1·75	1·57
164 „ „	1·56	1·17	1·04
218 „ „	1·17	0·87	0·78
273 „ „	0·93	0·69	0·63
327 „ „	0·78	—	—

PAGE 18 OF ESSAY.

Number of hits per round which may be expected by direct fire on a battery in position.

(1). RANGE 2,187 YARDS.

The angle of opening is 10°. Spread of bullets—

At 54 yards distance of burst	...	10 yards will cover one gun.								
„ 109	„	„	„	...	20	„	„	„	„	„
„ 163	„	„	„	...	30	„	„	„	three guns.	
„ 218	„	„	„	...	40	„	„	„	„	„
„ 273	„	„	„	...	50	„	„	„	„	„
„ 327	„	„	„	...	60	„	„	„	„	„

Area of target laying on the centre gun, 5 sq. yds. being the supposed target area of each gun when in action.		Hits per round.		
		15-pr. Mark II.	12-pr. Mark II.	German.
54 yards burst	5 × 2·6 = 13	... ...	9.8 ...	4·5
109 „ „	5 × 0·64 = 3·2	... ...	2·4 ...	3·4
163 „ „	5 × 0·28 = 1·4	... ...	1·05 ...	1·5
218 „ „	15 × 0·16 = 2·4	... ...	1·8 ...	1·4
273 „ „	15 × 0·10 = 1·5	... ...	1·1 ...	1·08
327 „ „	15 × 0·07 = 1·05	... ...	0·78 ...	—

(2). RANGE 3,280 YARDS.

The angle of opening is 12°, and the spread of bullets as follows:—

At 54 yards distance of burst	11·3 yards will cover one gun.									
„ 109	„	„	„	„	22·6	„	„	„	„	„
„ 163	„	„	„	„	33·9	„	„	„	„	„
„ 218	„	„	„	„	45·2	„	„	„	three guns.	
„ 273	„	„	„	„	56·5	„	„	„	„	„

Area of target laying on the centre gun.		Hits per round.		
		15-pr. Mark II.	12-pr. Mark II.	German.
54 yards burst	5 × 2·1 = 10·5	... ...	7·8 ...	3·4
109 „ „	5 × 0.52 = 2·5	... ...	1·8 ...	2·6
163 „ „	5 × 0·24 = 1·2	... ...	·9 ...	1·9
218 „ „	15 × 0·13 = 2·0	... ...	1·5 ...	1·3
273 „ „	15 × 0·08 = 1·2	... ...	·9 ...	—

Note.—It appears from the foregoing examples that accuracy of line is very necessary with our new shell owing to its very small cone of dispersion. This is particularly the case when the target is artillery, and it would seem best for each gun in a battery to attack the gun immediately opposite to it.

(4.) Table showing the correct distances of "point of burst" for British shell at various ranges, the fuzes being assumed perfect.

The following table gives the calculated distances of burst which are best for the various targets (neglecting error of fuzes) such as skirmishers, etc.

Calculated from General Rohne's Table V., Page 27.

TABLE I.

15-PR. MARK II. & 12-PR. MARK II.

RANGE.	THE DISTANCE OF BURST TO GIVE THE GREATEST EFFECT ON—			
	INFANTRY LYING DOWN.	INFANTRY KNEELING.	INFANTRY STANDING.	HORSEMEN.
Yards.	Yards.	Yards.	Yards.	Yards.
1,093	36	57	73	121
2,187	30	48	62	94
3,280	27	41	54	81
4,374	24	36	48	73

Note.—In all General Rohne's examples, the targets are taken as single lines. It is evident that for a target like a "column of fours," or a battery in "column of route," the increased depth and density of effect of the 15-pr. and 12-pr. shell would be a distinct advantage; very often, no doubt, the supports and reserves of the skirmishing line would be closed up to within 300 yards, thus the same shell would, if burst close to the first line, frequently sweep the second line as well.

Probably the greatest advantage of the small cone of dispersion is the increased distance over which the time shrapnel will be effective, and the smaller number of shell which will be wasted by bursting beyond the target.

EXAMPLE—PAGE 27 OF ESSAY. TABLE V.

(5.) Example showing the effect of variations in the times of burning of fuzes, and indicating the necessity for setting fuzes short.

We see from this table that the theoretically perfect shrapnel for time effect should be burst 23 yards short of the target for a range of 1,093 yards, supposing the latter to be infantry lying down. The 15-pr. and 12-pr. should be burst 36 yards short, *vide* Table I.

Now the remaining velocity at this range is roughly 1108 f.s. for the 12-pr., and 1045 f.s. for the German shell; and the difference between the longest and shortest burning of any five new fuzes (T. and P. short Mark IV.) is about ·25 seconds, equivalent to 92 yards range for the 12-pr. and 87 for the German shell, so that, supposing the mean fuze to burst, as intended, 23 yards short of the target, the short fuze would burst the shell 66 yards short, and the long one 20 yards over; therefore, to ensure all the shell being effective, the distance of burst would have to be at least 46 yards short. The German fuze would, therefore, always have to be set to burst the shell 23 yards short of the

most effective distance of burst, while the service shell would only have to be burst 13 yards short of the most effective distance, which is, as shewn in Table I., 36 yards, to ensure every shell bursting at least three yards in front of the target.

(6.) Table showing minimum distances of mean point of burst short of targets, necessitated by variation of time of burning of time fuzes.

Table of minimum distances of burst short of targets necessitated by variations in time fuzes. 12-pr. gun.

Range 1,000 yards, fuze should be set 50 yards short.								
,,	2,000	,,	,,	,,	,,	41	,,	,,
,,	3,000	,,	,,	,,	,,	33	,,	,,
,,	4,000	,,	,,	,,	,,	30	,,	,,

The 15.-pr. has practically the same muzzle velocity but having a better $\frac{d^2}{w}$ it retains its velocity longer and should, therefore, be burst slightly shorter than the 12-pr.

For the other targets, infantry kneeling, infantry standing and cavalry, our fuzes are just regular enough to enable us to use the theoretically best distance of burst to give the greatest effect.

(7.) Details of the 15-pr. British equipment, and that proposed by General Rohne, showing similarity.

The following is a comparison between the ideal gun suggested by the General and the 15-pr. Mark I.

	15-pr.	Proposed.
Weight of gun	7 cwt. ...	8·2 cwt.
Calibre	3″ ...	3·18″
Muzzle velocity	1550 ...	1574
Weight of shrapnel	14 lb. ...	15·4 lb.
Percentage weight of bullets to total weight	40 ...	41 (considered max. possible).
Bullets	200 35 to 1 lb. or 246 41 to 1 lb.	260 41 to 1 lb.
Remaining velocity at 2,700 yards ...	904 ...	925
Angle of opening	12° ...	18° 30′
Depth of effect[1]	390 yds. ...	270 yds.

In point of view of efficiency for weight of equipment, the 15-pr. is well up to the standard laid down as best available by Major-General Rohne, and the reduced angle of opening is of great value owing to the variability in time of burning of time fuzes.

It is gratifying to find that our shell fulfils in almost every particular the desiderata of the theoretically perfect shell described by General Rohne in his last chapter, the only serious difference being the angle of opening. It has already been shewn in section 5 that a small angle of opening is most essential with our present fuzes, and that our shell has great advantages over the German shell when attacking all other targets save artillery in position; if straight shooting and accurate laying can be relied on, the small angle has similar advantages when engaging artillery. The British infantry have always been renowned for the accuracy of their aim, the artillery must be equally so.

It is also to be observed that the latest trials carried out at Shoeburyness shew an angle of opening at 2,000 yards of only 7°, which is

[1] Taking minimum useful striking velocity for bullets of 35 to 1 lb. at 390 f.s., and for bullets 41 to 1 lb. as 362 f.s. and approximating from author's table, page 55.

a very marked improvement on 10°, the angle of opening used throughout the calculations for a range of 2,000 yards.

NOTES.

(1). The German shrapnel from which Major-General Rohne's examples are worked out appears to be the 1891 pattern, of which the bullets are very light, weighing 41 to the lb. against 35 to the lb. for the British service shrapnel (of which, by the way, the weights, etc. are wrongly given in the Appendix).

(2). The number of fragments in the German pattern is taken as 300, as against 200 for the British service 15-pr. and 150 for the 12-pr. It is to be remembered in comparing the effect that each German shell fired means 1½ lb. more weight expended than our 15-pr. shell, and nearly 3 lb. more than our 12-pr. shell.

(3). The m.v. in the British shell is 1550, the German 1450. This increase of velocity taken with our heavy bullets justifies us in extending the distance from burst over which our shrapnel bullet is likely to be effective.

(4). Details of the target area covered by the German shell are not given in this paper, as they can be readily seen by reference to the General's essay.

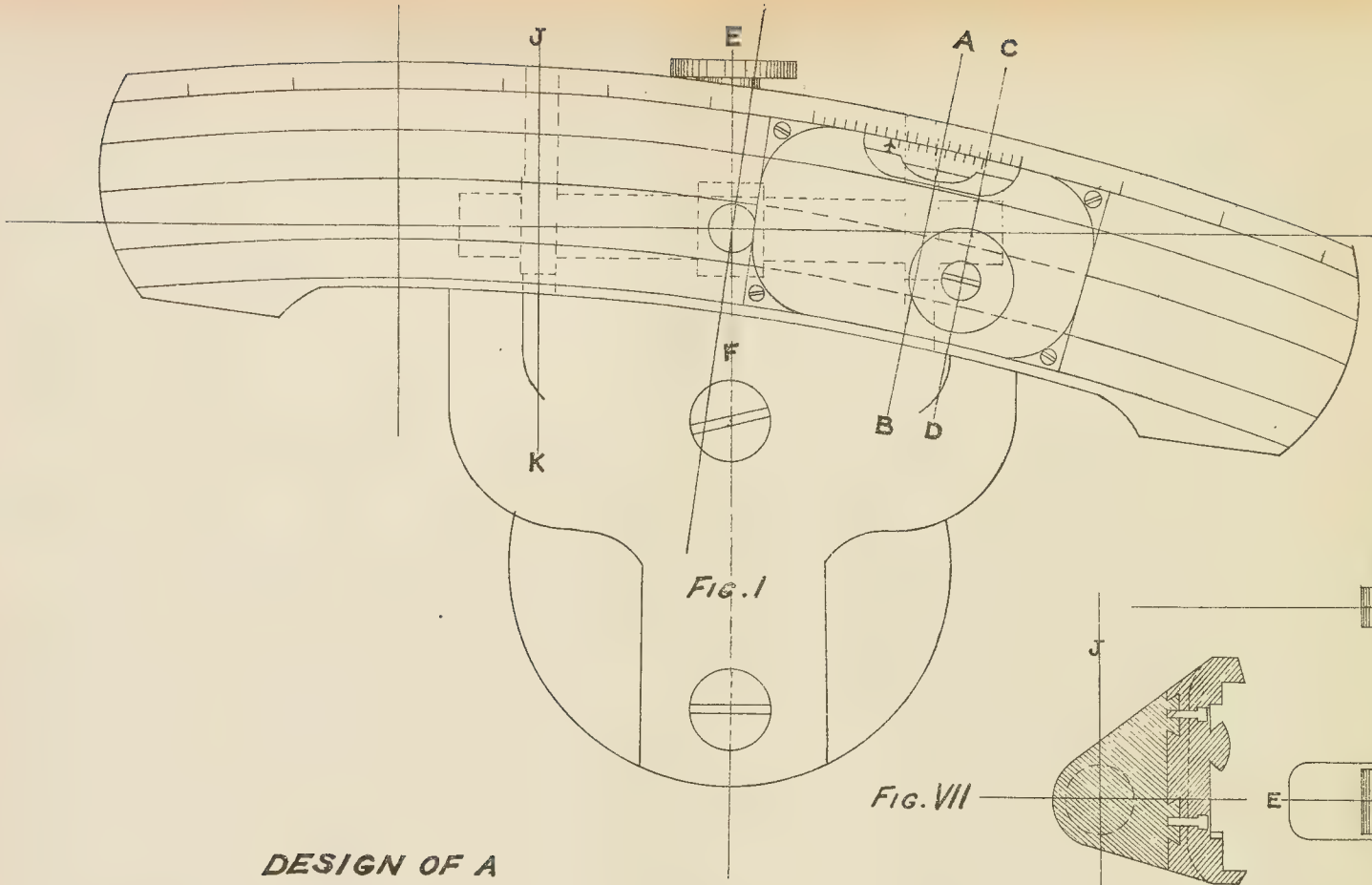


FIG. I

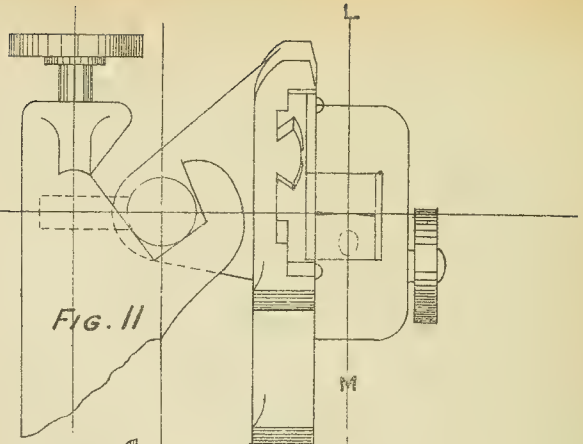


FIG. II

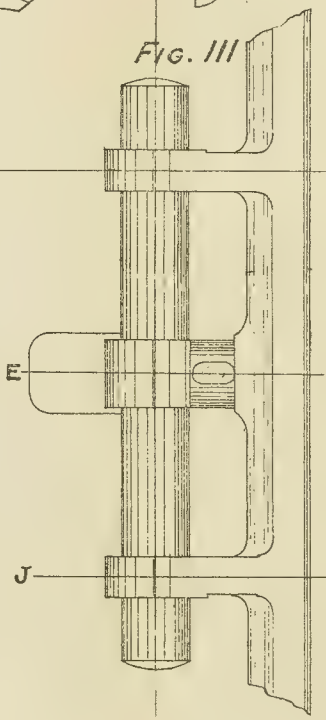


FIG. III

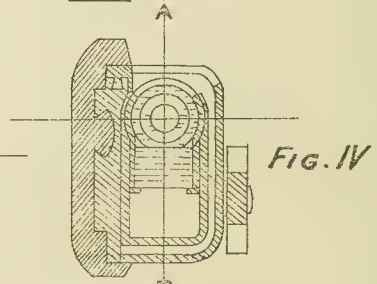


FIG. IV

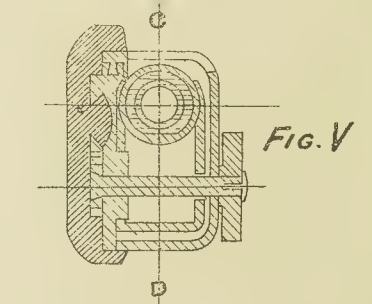


FIG. V

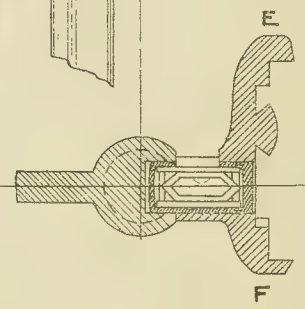


FIG. VI

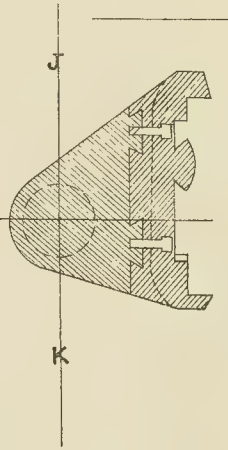


FIG. VII

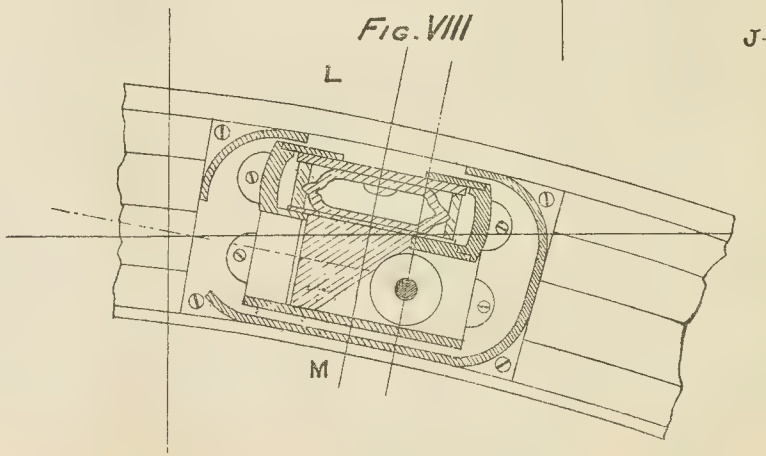
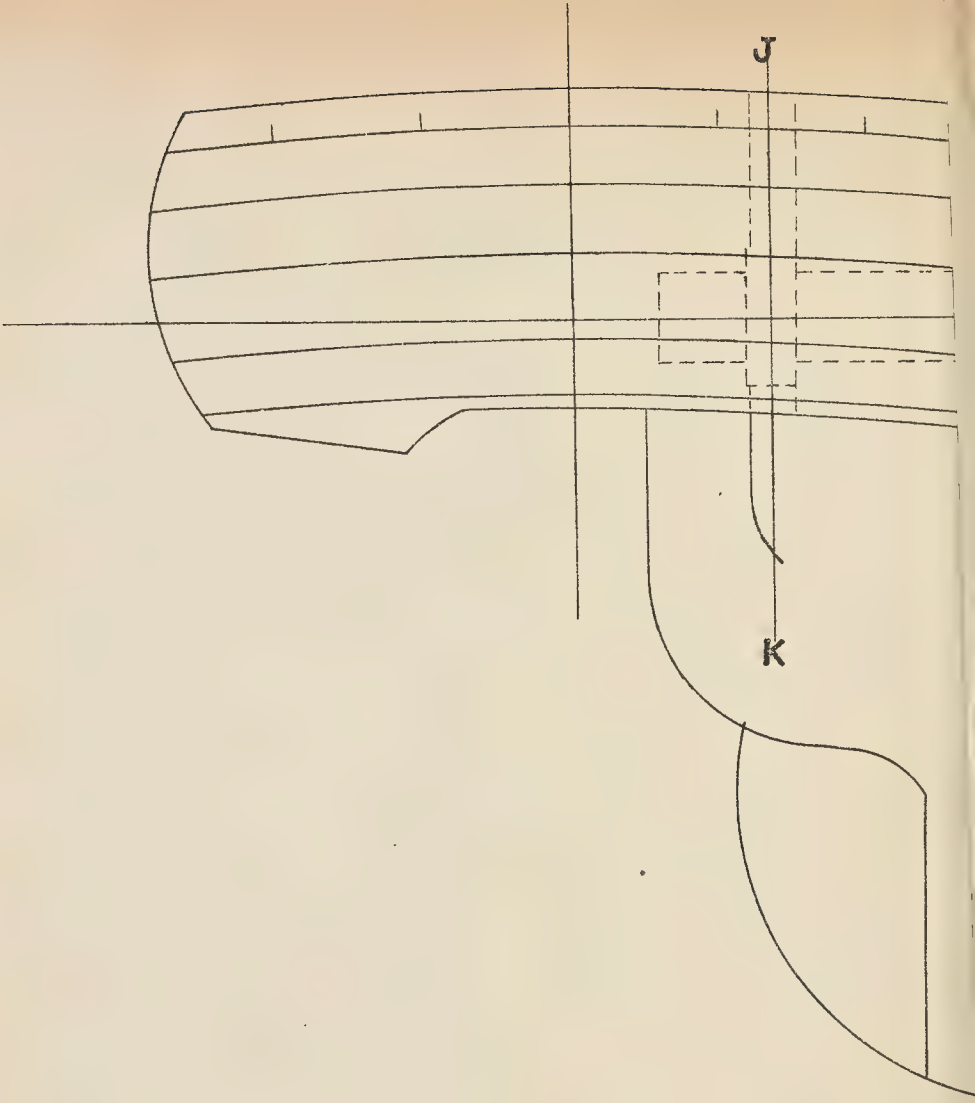


FIG. VIII

DESIGN OF A PRISMATIC CLINOMETER FOR FIELD GUNS.



DESIGN OF A

PRISMATIC CLINOMETER FOR FIELD

RANGING BY CLINOMETER.

BY

CAPTAIN P. J. R. CRAMPTON, R.A.

As any new methods which may possibly render the process of ranging a quicker matter than it is at present, will no doubt be of interest to all gunners, I will make no apology for offering the following :—

At practice camps, the average of rounds fired to fix the elevation is about 7, and the time taken about 3 minutes from the 1st round, or 26 seconds per round, and altogether 4 minutes are expended after coming into action before the fire of a battery can be expected to have any perceptible effect, the completion of the process of ranging—fixing the length of fuze—takes a further average of 2 minutes, but in this portion of the process some effect may reasonably be expected, and though improvements in the graduation and means of setting fuzes may reduce this period somewhat, it is in the first period that of ranging for elevation that there is most scope for greater celerity.

A certain time must be allowed the battery commander for observation ; to make up his mind whether the shot is + or — and to give a fresh order for elevation. The time taken largely depends on the individual, and is not dependent on any "adjuncts" except on a good pair of glasses. It is after the fresh elevation is ordered that an unnecessary delay occurs—unnecessary in that this period could be shortened by improved adjuncts and sub-division of duties at the gun.

For before another round can be fired, the tangent or Scott's sight has to be reset, replaced in the sight holes or on the bracket, and the gun relaid over the sights, and this especially with the Scott's sight is a comparatively long matter.

Various methods have been employed to make the laying quicker, such as the Lowther wheel, the Swiss method of giving a turn or portion of a turn to the elevating wheel, a new experimental indicator, etc., etc., all being attempts to alter the elevation of the gun without relaying by using what is practically quadrant elevation, but all these plans have, I believe, been found to be too inaccurate.

The only satisfactory way of giving quadrant elevation to field-guns is by clinometer, but the instrument must be a reliable one and, therefore, a short review of clinometers in general will not be out of place.

The present field-service clinometer is now practically obsolete, but its defects are interesting if only as a warning.

(1). It requires close observation and careful adjustment to place it correctly on the cut plane of the gun with the axis of its level in or parallel to the vertical plane of the axis of the gun.

If not correctly placed an error is the result.

(2). It is practically necessary to remove it from its position on the cut plane if any alteration in elevation is necessary.

(3). If the gun wheels are not level the angle of elevation shown on the drum is not the true elevation.

(4). The means of reading the drum is inaccurate owing to unequal wear of the screw and thread.

(5). Even when new it will not stand the jolts of transport in a limber box and becomes unreliable.

(6). The gun-layer cannot conveniently see the bubble of the spirit-level from the elevating position.

Another clinometer is the Scott's sight, when fitted with a horizontal level, and when so fitted it is, perhaps, the most satisfactory clinometer that we have yet had, as objections 1 and 3 to the service clinometer are quite obviated, and the elevations given on the degree scale are fairly reliable. The scale, however, is struck on too short a radius and is rather hard to read in consequence.

All Scott's sights are now to be fitted with horizontal levels so as to make the sight do double duty, both as a sight and as a clinometer; and this will, no doubt, be a very good make-shift until something better is obtained; by which time telescopic sights will probably be found to be more trouble than they are worth and the tangent sight and clinometer, more especially the latter, alone relied on.

A drum with yard scale has been added and is to be used instead of the arc marked in degrees, and this, though giving a more open scale and so facilitating setting without the use of a vernier, will probably be found open to objections (4) and (5) made to the service clinometer. In addition to this probable cause of unreliability there is another—there is an adjustable zero. Now the natural state of all adjustable zeros is never to be in adjustment at zero, and this fact is often forgotten when wanted for use, the result being in and out shooting by each gun of a battery. This fact is very well exemplified by the slow motion elevating nuts on the top of tangent scales which recently were ordered to be soldered up fast at zero for this very reason.

I am, of course, aware that a more open scale has been very generally demanded by the Regiment, and that drum reading seems the simplest way of giving it, and further that there is a very general belief (though not amongst battery commanders) that the small errors of elevation which would be introduced by the drum would not much matter in a gun which is essentially a shrapnel gun. Nor do they much matter once the elevation has been found, but I would appeal to battery commanders to say if in and out shooting during ranging for elevation is not the most fruitful of all the causes of failure and waste of ammunition at practice.

The above are the only patterns of which we have had practical experience, and the result has not been very encouraging to supporters of quadrant elevation, though battery commanders have done their best

for both Scott's sights [1] and clinometers, sometimes even to the extent of sending them by rail to practice camps instead of trusting them to the limbers on the line of march, and even then the results obtained by clinometers were not satisfactory.

It has been evident for some time that we want a new clinometer and different patterns have been experimentally tried, and of these the German pattern seems to have been the most favourably reported on. It has, however, an adjustable zero, the disadvantage of which has been touched on; but the adjustability is not an essential part of the design and could easily be left out.

This instrument is said to stand the jolting and rough usage inseparable from service conditions and so does away with objections (2), (4) and (5) to the service clinometer, while the Scott's sight, used as a level, does away with objections (1) and (3).

If, therefore, a curve with sliding level, could be attached to the trunnions of a Scott's sight so that it would fit into the slots on the Scott's sight bracket, objections (1), (2), (3), (4) and (5) would be done away with, whilst objection (6) could be easily got over by a simple device to be described further on.

We should then have an accurate clinometer having an open scale and some means of showing the position of the bubble to the gun-layer, fitted with a cross level and trunnions to go into the bracket of the Scott's sights; and if such a design would stand service conditions, it is probable that all the objections mentioned would be met.

I beg to submit herewith a design for such a combination.

Figure I. is a side view of the clinometer showing it resting in the Scott's sight bracket. The trunnions on the far side are indicated by dotted lines.

The principle is the same as that of the German pattern, viz., a spirit-level sliding along an undercut curve, only in this case the slide is fixed to the side of the curve instead of on the top, and there is no adjustable zero to measure the angle of sight.

Such an adjustment could, however, be easily added if considered desirable.

The slide containing the level is moved along the curve by means of a thumb wheel and ratchet, which is shown in section in Figure V.

Figure II. shows an end on view of the clinometer looking from the gun-layers position, the position of the bubble is made visible by means of a prism.

Figure VIII. gives a lateral, and Figure IV. a cross section through both level and prism.

Figure III. gives a view of the instrument looking down on it, showing the trunnions and the cross level.

Figure VII. shows the method of attachment of the trunnion to the curve.

Figure VI. gives a section through the cross level.

[1] N.B.—No reflection whatever is intended on the Scott's sight, which has done admirable service as a sight and would no doubt do further good service as a clinometer if not spoilt by the addition of what has been proved to be unreliable complications, viz: Drum reading and an adjustable zero. But, if there is a doubt as to whether telescopic sights will stand much travelling on the limbers, how much more doubt must there be when they are still further complicated.

As to the graduation of the curve :—

It is obviously absurd to graduate an instrument which measures quadrant elevation in yards, while division into degrees and minutes is inconvenient. It seems as if the best thing would be to take some conveniently sized unit which would mean something to a gunner, for instance a unit can be found, the addition or substraction of which from the quadrant elevation will raise or lower the trajectory as many feet as there are hundreds of yards in the range.

11·46 minutes is such a unit, and 11·46 minutes measured at the circumference of an arc struck at 30 inches radius (as is the arc in the design) measures one tenth of an inch.

This is a convenient unit for laying, and it can be further subdivided by a vernier so as to read 1·146 minutes, as is done in the design which reads from 20 units depression to 90 units elevation, or from about 4 degrees depression to 18 degrees elevation.

There is no doubt that such an instrument would be most useful as soon as the ranging was complete and ordinary fire established, and it is probable that the use of such a clinometer would also lead to quicker ranging.

For, instead of the tedious repetition of resetting the sight, replacing in the sight hole or bracket, and then relaying the gun, which at present follows every alteration in elevation, the work could be subdivided as follows :—

One number at the gun would stand close to the clinometer and follow up every alteration given by the battery commander; this he would do by a simple turn of the thumb wheel, and there would be no necessity to remove the clinometer from the bracket. Another number at the gun would follow up each alteration of level by bringing the bubble into the centre of its run as seen in the prism.

Such a method would, I am sure, save 10 seconds at least at each alteration of elevation and shorten the process of ranging by between 1 and 2 minutes.

I would suggest the following drill :—

(1). Deliberate advance.

The commanding officer would advance as usual, determine the elevation due to range and angle of sight and have all the clinometers set at one given elevation before advancing.

On coming into action, No. 4 would place the set clinometer on the bracket, level it by the cross level and stand close to the sight to make any alterations ordered by the commanding officer; No. 1 would go to the elevating wheel and bring the bubble of the level to the middle of its run as seen in the prism after every alteration in elevation.

(2). Direct advance.

The gun in the command farthest from the flank which opens fire would take the quadrant elevation after laying by tangent sight, and communicate it as soon as possible to the commanding officer, when the same method as before would be adopted.

FLIGHT AND FLYING MACHINES.

ILLUSTRATED WITH NUMEROUS LANTERN SLIDES INCLUDING MANY LENT BY HIRAM S. MAXIM, ESQR.

BY

DR. G. H. BRYAN, F.R.S.

(A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 27th Feb., 1896).

MAJOR-GENERAL F. J. MAURICE, C.B., IN THE CHAIR.

THE CHAIRMAN—We are anxious, ladies and gentlemen, to begin as soon as possible and, therefore, I will at once introduce you to Dr. Bryan, who will give us his lecture on Flight and Flying Machines.

DR. BRYAN—General Maurice, ladies and gentlemen, with all the resources of modern science there is one element which has hitherto baffled man in his endeavours to master it, namely, the atmosphere. He traverses the land and sea with speed and comfort which leave nothing further to be attained except greater speed and greater comfort, and yet birds flying in the air, as they have done for thousands of years, are able to keep pace with his swiftest express trains.

I propose this evening to treat the subject of flight more or less according to the historical order of its development. We will first examine how birds and animals learnt to fly, in the first instance, *i.e.*, how they were able to acquire the power of flight gradually in the course of evolution before they were provided with fully developed wings. Next, I hope to briefly deal with the question how birds do fly at the present time. After that, I propose to touch on the attempts at artificial flight made during the last and beginning of the present centuries when ingenious inventors designed and sometimes even went so far as to construct most fantastic and grotesque flying machines, with which they proposed to support themselves in the air by their own muscular exertions. Then I hope to prove to you that those early attempts were bound to fail, but that modern discoveries have, so far, modified the problem of flight as to give us hopes of soon being able to learn to fly. It will be seen that the early experimenters began by

designing their machine, taking it for granted that it would fly when constructed, in other words they thought they would be able to fly without learning; and it is only quite lately that people have realised the necessity of learning to fly first, *i.e.*, learning the laws of flight before building a flying machine, which of course is the natural order to follow.

As flying is a form of locomotion, let us first consider the problem of locomotion generally. The fundamental principle underlying every form of locomotion is involved in Newton's "Third Law of Motion," which states that *action and reaction are equal and opposite*. One of the simplest illustrations of this law, and one with which every artillery officer is familiar, is that afforded by the recoil of a gun. A bullet cannot be fired without making the gun recoil, and the problem to be solved in the construction of guns is, to get as much as possible of the energy produced by the combustion of the gunpowder usefully employed in driving the bullet forwards, and as little of it as possible wasted in driving the gun backwards. In order to accomplish this, we must make the gun as heavy as possible and the bullet very light, for the heavier the gun and the lighter the bullet, the greater will be the proportion of the energy imparted to the bullet; in fact, the energies of the gun and bullet are inversely proportional to their masses. Supposing, therefore, that the gun is one hundred times the mass, *i.e.*, one times the weight of the bullet, then the bullet will have one hundred times the energy of the gun, that is, one hundred times the power of doing damage. Thus, that if we put one hundred and one ounces of gunpowder into the gun, only one ounce will be wasted in producing recoil, and one hundred ounces will be used in propelling the bullet.

In the case of locomotion we and our vehicle take the place of the bullet, and the earth, the water, or the air takes the place of the gun, according as we are travelling by land, water, or flying. The inference is that the mass that we act on must be made as great as possible so as to utilize as much energy as possible in moving ourselves forward. In walking, the action of our feet tends to drive the earth back, and the reaction of the earth, which is equal and opposite to this action, tends to move us forwards. Here, practically, the whole of the energy we exert is usefully employed in producing locomotion, for the mass of the earth is so enormously large that we do not communicate any appreciable energy to it. In swimming, we drive the water backwards and its reaction impels us forwards; similarly in flying, we should have to drive the air backwards and downwards; in order that its reaction may impel us forwards and upwards, we must act on as large a mass of earth, or of water, or of air as we can. To illustrate the difference between locomotion on land, locomotion in water and locomotion in air, we may compare such animals as the ox, the porpoise and the bat, which have been chosen by Pettigren in illustration of the subject. For swimming, fairly large appendages are required by the porpoise in order to act on a considerable mass of water; but air is so much lighter than water, that in order to fly a bat has to have far larger wings in proportion to its size; and a similar difference would have to exist between the construction of flying machines and of steamships.

Let us consider, in the first place, how animals learnt to fly. It may be stated, as a fundamental fact, that small animals found it much easier to learn to fly than large ones. M. de Lucy prepared a table giving the area of wing surface of large and small animals for every kilogramme of weight supported, that is, he divided the area of wing surface (in square yards or square feet) by the weight of the animal in kilogrammes. His table shows that large animals have a much smaller amount of wing surface in proportion to their weight than small ones. The crane of Australia has only 130 square inches per kilogramme, whereas a bat has 11 square inches.

The general law connecting the area of the wing surface with the weight may be very simply expressed. Suppose that we double the size of an animal and *make it exactly of the same shape as before, so that its various parts have the same proportions*, then the *superficial area* of the wings will be increased fourfold, but the *weight* will be eight times as great, so that the area of wing surface per kilogramme will be half as great as before. This law of relation, M. de Lucy found, was approximately verified by actual observation, and hence it follows that large flying animals are (roughly) similarly proportioned to small ones. Assuming this to be the case, we may prove that small animals (such as insects) must have found it much easier to learn to fly than large ones, the reason being that they were not exposed to the same risks and dangers. In the first place it is popularly supposed that a flea, if magnified to the size of a man, would be able to jump over the top of St. Paul's; as a matter of fact that is not the case; it would jump to precisely the same height as it does now. Of course, it would be capable of exerting much greater energy in jumping, but then it would have to lift a proportionately greater weight, and so it would lift itself to just the same height by exerting the same amount of energy in proportion to its weight. Similarly, a small animal, if it were to fall to the ground from the height of say a yard, would sustain about the same proportionate amount of injury from the effects of the fall as a large one, *supposing both to strike the ground with the same velocity*. Now a small insect would have room to fly in a height of a few inches, to a foot or so above the ground; but a large animal would require a considerably greater height to fly in; so that the injury from an accident would be much less for a small than a large animal. If a small insect falls through a few inches, it will not hurt itself much, but if we were to construct an artificial flying machine, this machine would have to be made so large that we should have to rise to a height of at least 20 feet from the ground before we could expect to attain any useful results, and a fall from a height of even 20 feet would be, to say the least, highly dangerous. We may, however, even go further and state that a fall from a height of 20 feet would not do the same harm to a beetle or a small insect that it would do to a larger body, because of the effects of the resistance of the air in checking the fall. In illustration of that, I have arranged an experiment to show you that small bodies, allowed to drop from a height, are more retarded by the resistance of the air, and therefore descend more slowly than large ones. I have fixed to the ceiling three pieces of paper, one of them is a small square, another one cut out from

the same piece of paper, is a square of twice the length and twice the breadth of the first, and therefore, of four times the area; it is, therefore, four times the weight of the first. You will see that these two squares fall to the ground in the same time. But the two squares are of the same thickness, and therefore their dimensions are not all proportional as they should be, according to M. de Lucy's law. Accordingly, I have taken another piece of paper of double the thickness of the first, and have cut out a square twice the length, twice the breadth, and twice the thickness of the smaller square. This square is, therefore, eight times the weight of the small one, although it is only four times the area. When I pull this string and release these three pieces of paper, what we ought to see (if the experiment comes off properly) is two squares of paper, one large and one small one, fluttering down at about the same rate, and another large square coming down a good bit faster than either of them. I now pull the string. This square which fell a little before the others we shall find is the paper of double thickness; but the other two squares fell almost together. So that supposing an insect were learning to fly and it were to drop through 20 feet, turning over and over in its descent as did my squares of paper, *it would strike the ground with lesser velocity,* and therefore, would not hurt itself as much, in proportion to its size, as we should do if we were experimenting with a flying machine, and were suddenly lose control of the apparatus and to drop through 20 feet. The tiny insects, called "fairy flies," well show what very slender wings are sufficient to enable a very small insect to fly. These insects are microscopic flies, you can hardly see them with the naked eye, and a highly magnified representation shows that the wings are really hardly thicker than the legs.

Now, although insects found it easier to learn to fly than larger animals have done, small insects like these fairy flies would, of course, stand no chance of holding their own against a strong wind, and consequently we find that as insects have developed they have gradually grown heavier, and their proportion of wing area to weight has diminished. Finally, one order of insects, (namely, flies or *diphera*) have found that for getting through the wind, two wings are better than four, and they have accordingly lost the hind pair of wings altogether. Moreover, these flies are much heavier in proportion to the size of the wings than other insects; but then, of course, they require enormously greater muscular power to maintain them in the air.

The flying fish and flying gurnard may be said to represent another type of animals in the stage of "learning to fly." They can go through the air for short distances, but they have not developed sufficient muscular power to fly continuously. The reason why this flying gurnard and also this flying fish can fly imperfectly without danger, although they cannot fly long distances is because they start off the surface of the water, and if they fall in again they do not receive a large shock that injures them like an animal of the same size would experience if it fell on dry land. For this reason it is very easy for them to practise flying, and we have good reason to believe that the birds are descended from animals which were amphibious in their habits, and that they acquired the power of flight in this way. It

seems quite likely that we might find it very useful in experimenting on flying machines, to try starting them over the surface of water. Another animal, which is "learning to fly," but has not yet learnt, is the flying squirrel; this has developed a large sort of wing surface which helps to sustain it in leaping from bough to bough, and its agility saves it from any danger of accident.

The next point that I propose, consider, and to illustrate by slides is the flight of birds. M. Marey, as many of you are probably aware, has made a considerable number of experiments on the action of bird's wings. One of his apparatus, which he attached to a pigeon, is a sort of recording apparatus. You might exclaim "poor pigeon," but I believe the pigeon does not mind the apparatus much; M. Marey used a pigeon which has got accustomed to it. Various recorders were attached to different parts of the wings, in order to ascertain the variations in their position and also in their inclination during each stroke. In this way M. Marey constructed a diagram showing the results of these experiments. This diagram shows the path of the tip of the wing and the various changes in the inclination of the wing during a complete stroke. You will see that the motion is not really an up-and-down action, but the tips of the wing travels in a sort of oval, and you will also see the varying inclinations of the wing surface which enable it to perform useful work in driving the bird forward and supporting its weight during the whole of the stroke. There is a mechanism that produces somewhat similar motion in the feathering paddle or paddle steamer; but whereas the paddle only requires to be made to "feather" during a small portion of each rotation in order to keep the blade perpendicular to the water during its immersion, this bird has to "feather" during the whole stroke, as the inclination of the wing varies at every point of the path. It is obvious that this action would be very difficult to imitate by means of any single machinery, and for this and other reasons the screw propeller is a much more convenient mechanism for the purpose of experiments on artificial flight. M. Pénaud has, however, constructed a bird with flapping wings, which do not move in an oval curve, but flap up and down on hinges. These wings are made of silk, which makes them flexible. I think you will see, when I set this model off, that it will rise in the air; it does not fly particularly well, but I hope to show you some that fly better. The present model only flies a short way and then falls; but a much larger one that M. Pénaud made flew a considerable distance, alternately rising and falling.

I now propose to say a little about the photographic method of observing the flight of birds, which has also been developed greatly by M. Marey. Muybridge, you know, used a number of cameras for taking series of instantaneous photographs of moving objects, but while this plan answered very well for a galloping horse which had to go in a known direction, it would not be suited for taking photographs of objects whose direction of motion was uncertain, as in the case of birds. Accordingly, M. Marey found that for photographing birds in mid air a kind of photographic gun was the best apparatus. This gun had a revolving plate which makes a number of successive exposures,

and it might therefore better be called a "revolver." Now, I feel very diffident in saying anything about guns before the members of the Royal Artillery Institution, but I cannot help thinking, as the result of personal experience, that this photographic gun would be an excellent thing to put in the hands of our volunteers for class-firing, instead of the Lee-Metford rifle. If every volunteer, in order to fire his third-class, were required to take a certain number of "snap-shots" at the targets with this harmless camera, and if these photographs were properly developed under official supervision, a smaller number of deaths would annually occur from stray rifle-bullets, and a smaller number of volunteers would succeed in firing their third-class! M. Marey gives an excellent photograph of the path of a projectile going through the air, which well illustrates the advantages of instantaneous photography, You will see, that in order to illustrate the well-known propositions of our text-books, that the path of a projectile is a parabola, and so forth. the simplest way is to make a number of successive exposures on the same plate. This photograph will explain the whole thing on a single diagram; if carefully examined, it will show the horizontal distances between the successive positions are equal, and hence that the horizontal velocity remains practically constant. Thus the whole of what takes a considerable space to prove theoretically in our text-books may be very readily verified graphically.

We will next examine what is the effect of taking a large number of successive images of a gull on the same plate. If the exposures are made at very short intervals, the result is a blurred jumble giving the appearance of a number of gulls all eating each other up. In order to separate the images, various methods have been suggested. One involves the use of a revolving mirror by which each image is reflected on to the plate a little in front of the preceding one, so that they no longer overlap. In a photograph of the same gull, taken by a revolving mirror, the images are completely separated, and can be examined individually. In both this and the aforementioned blurred photograph there are 50 images per second. There is another method called the stroboscopic method, which I should like to mention, because it somewhat resembles a method used by Professor Boys, in his highly successful lecture on ripples, to show waves travelling along the surface of liquid. If we consider the action of a wing in going down and up as constituting one complete stroke, we take the first photograph of the bird when the wing is (say) at the highest point; we take the second photograph when the wing has made *a little more than one complete stroke, i.e.*, when it has gone down and up, and has again gone down a little below the highest point; we take a third when the wing has made a little more than one complete stroke after the second, and has got a little further down still in its path and so forth, and when these photographs are developed we find that the succession of images simply represents the various phases in one complete stroke of the wing. Moreover, the images no longer overlap, because the bird has moved through the distance traversed in a complete stroke and rather more in the interval between two consecutive exposures. A similar method might be applied to examine the motion of waves or ripples on

water or any other periodic motion. We should use an intermittent light to illuminate the ripples when the crest of one wave was passing a particular point, and to illuminate it again when the crest of the next wave had just passed over the same point and so forth, so as to make the observed changes of position appear much less rapid than the actual motion. By this method M. Marey has obtained figures of a gull flying horizontally, ten images per second, and also of a pelican descending, which show the action of the wings fairly well. He also gives a figure of a pigeon ascending, which illustrates another point. If, instead of taking the photographs at an interval slightly *greater* than one complete stroke of the wings, we take them at an interval slightly *less*, then in the second photograph the wings will be a little further back than in the first, in the third a little further back than in the second, and so on; and the result is that, although the pigeon is ascending, the action of the wings is represented in the reverse order to that in which it actually occurs, it looks as if the bird were, so to speak, flying backwards, although it is really going forwards. Another photograph of a pigeon settling, illustrates how, when the bird is just coming to rest, it turns its wings nearly vertical, and gives several very powerful forward flaps to destroy its horizontal velocity. This action has to be imitated in soaring experiments, such as those of Lilienthal. In coming to the ground, it is necessary to throw the wing surface forwards and upwards, so as to present the great resistance to the forward motion, otherwise the experimenter will be sure to fall over head foremost. M. Marey has also taken simultaneous photographs of a gull seen from three different directions. In his figures, one view is taken from below, another is taken from the side, and a third is taken from directly behind the bird, and these three views of the same thing were used to construct a series of models of a gull, showing the action of the wings in different stages. On placing these models inside a stroboscope, and making it revolve, the whole series looked exactly like a number of birds flying round and round.

Passing from natural to artificial flight, I propose to give a brief outline of the early history of the subject, and to show a few of the grotesque flying machines devised and in a few cases even constructed, but never actually tried up to the beginning of the present century. The first person who is supposed to have constructed a flying machine was Dædalus. According to legend, Dædalus attached wings to his body so that he could fly, but he got a little bit too near the sun, which melted the cement, by which the wings were attached, and down he dropped. The probable explanation of the legend is that Dædalus (as we have reason to believe) was the first inventor of sailing ships, and the resemblance of the sails to a bird's wings naturally made people think that he had attached wings to himself.

In 1500, Leonardo da Vinci made some ingenious experiments on the same subject; but one of our earliest figures of a man with wings was given in a novel by Retif de la Bretonne on the "Flying man and his voyage to the South Pole," published in France in the 17th century. In 1678, a locksmith, named Besnier, invented another kind of flying machine. He had wings on his legs and wings worked by his arms.

These wings were double, and his idea was that when you depressed them they would open, and when you raised them they would shut. Besnier made a few experiments; he first jumped off a stool, then he jumped off a table, then he jumped out of a window, and finally he actually succeeded in jumping off the top of a barn; and the *Journal des Savants* tells us that his experiments met with "*relative* success." Subsequently he sold the machine to an acrobat, who used it "*with* success."

In 1709, a Portuguese, named Barthelemy Lourenco, designed a flying machine, of which illustrations occur in old books. The idea was that two spheres were to contain some sort of magic substance, I am not sure whether it was electricity or magnetism (you observe that I speak of them as a substance, as they were considered so in those days) which would help the machine to lift itself into the air. I think that substance Lourenco had in view must really have been what all balloonists would give anything to find, namely, something which is lighter than nothing and has a tendency upwards. In addition to these spheres there were a large number of funnels hanging from the top, which upon a windy day would conduct the wind to the under side of these awning and make it act as a sail. If the wind was not blowing, why you took a pair of bellows, as the man is doing in the old figure before us. If Barthelemy Lourenco could not make his machine fly, at any rate he knew how to play his cards very well. He wrote to the King of Portugal and explained his idea; he said he had invented a flying machine, and there was one favour he would like to ask of the King, namely, as it might be rather awkward for every one to be able to fly away out of his dominions when they were wanted, he asked the King to grant him the sole monopoly of making the machine. The King of Portugal wrote back to say that the request was far too modest a one, and that in consideration of this wonderful discovery, he appointed him professor of mathematics at the University of Coimbra, at a salary of 3,750 pounds a year in French gold. I could only wish that it was so easy to become a professor of mathematics now-a-days! In spite of the Royal decree, however, the machine was never constructed, but Barthelemy had got what he wanted. In 1742, the Marquis de Bacqueville tried to cross the Seine with wings. That he went in to the water was, of course, to be expected, but unfortunately he broke his leg in addition, and the *Histoire des Ballons* tells us that the attempt produced no further results! About 1783, Mont Golfier invented the balloon; and among his first disciples was one Blanchard. Before taking to balloons, Blanchard designed a most grotesque flying machine, in which you sat in a chair and by working levers with your arms and legs you raised and lowered four large paddles which were supposed to lift the machine. In the French picture a small boy is represented in the stern of the machine blowing a penny trumpet to warn people to get out of the way. Although the machine was designed, Blanchard expected to get too little recompense for his experiments, and he was going to leave the country when the Abbé Devrunay kept him back, and recommended him to take to balloons. Later on Blanchard and his wife both became well known aeronauts.

About the same time the balloon fever set in, and everybody tried balloons. Now it has been popularly supposed that the great objection to a balloon is that it is impossible to steer it, but in the 18th century, after long and laborious experiments, the French people actually discovered an *infallible* method of steering a balloon, of which an old print has been handed down to us, and I believe there was a comic song published in connection with it. The characteristic French engraving really represents a balloon being drawn along by donkeys, the man on the balloon is suspended by his waist and is blowing a horn and carrying a lantern to signal to the donkey drivers. Balloonists made fortunes in those days, and of course they got up no end of wild schemes and fantastic devices to attract the public taste; and one Robertson designed an aerial vessel called the "Minerva," with which he proposed to make a tour of the world. The figure shows a globular balloon with a gigantic bird (the gallic cock) at the top, and there was a ship attached to the balloon in case the thing should come to grief and they should have to sail across the sea. Below the balloon suspended by ropes was an enormous barrel containing provisions and various things necessary for the voyage, and near it a little house was suspended like a bird-cage hanging from the ceiling for any inquisitive ladies, who wanted to accompany the expedition, and who did not wish to be distracted by the presence of the other members of the party! Well, this balloon fever seems to have diverted people's attention from the subject of flight proper, but somewhat later one Jacob Deeghen made a few experiments with a kind of double parachute, which he was to work up and down for the purpose of lifting himself in the air; but he found out that it would not quite lift him, and so he attached it to a balloon. He might just as well have left out the parachute now, one would think. He took it to Paris and wanted to get an exhibition there, but he was an Austrian, and of course the French did not very much like the Austrians, accordingly they pulled his machine to pieces and gave him a thrashing, so that his experiments never came off. In 1850, a Frenchman, M. Pétin, devised a great aerial vessel with which he actually succeeded in raising 1000 pounds. You must not, however, suppose that the machine lifted this weight in the air. He counted his pounds in money and not by weight, and got them by raising the wind, that is to say, going round and collecting subscriptions to the tune of £1000 to make his machine. The machine was designed and built; but before M. Pétin could make an ascent in the air, he happened to quarrel with some of the officials, and the Prefect refused to give him the necessary permission to let it up. Perhaps that was lucky. At anyrate, as he could not try the thing in France, he went over to England, and then he went over to America. In America he got another machine constructed, and made preparations to let it off at New Orleans; the machine was all ready in the *Place du Congo* (so the French historian relates) but it was found last thing that the gasworks were not equal to the occasion! M. Pétin could not get sufficient gas to inflate his balloons, so he again had a very good excuse for not going up. The machine consisted of a platform supported by five balloons side by side and with a gigantic screw propeller in the centre.

I am not sure whether he intended to drive the apparatus by means of a traction engine; the figure shows an engine of this kind at one side of the platform, which would be, one would think, rather a heavy load for the balloons and likely to overturn the machine. But M. Pétin said very little about the motive power, and that was one of the weak points in his scheme. Before concluding this subject, as most of you know the Crystal Palace, I should like to call your attention to a picture from the same source (the French *Histoire des Ballons*) of the famous ascent of Glaisher at the Crystal Palace. I doubt whether anyone looking at M. Tissaudier's figure would recognize the Crystal Palace, and to make things more absurd the description underneath the picture calls it "Ascension de Monsieur Gaisler a Glaisher Palais"! A few miscellaneous things I have gathered from the same source are interesting as showing how easy it is when a machine would not fly to find excuses for it. A kind of aerial machine was proposed by Lanson, who made experiments with it, but the results were far from conclusive. A certain system of steering a balloon, invented by Monsieur Hellé, was never experimented with. Another navigable balloon was constructed by M. Dupuy de Lôme, but the experiments made during the war did not give any result. Of a fourth contrivance a model was made by M. Julien, who exhibited it at the Hippodrome,; it was a small model and would not work. That did not prove M. Julien to be wrong, because the model was too small to give him a fair chance. If it had been made sufficiently large it would have gone all right of course, at least the inventor said so.

Finally, M. de Landelle designed a steam flying machine which is described by Pettigrew, having two *vertical* screws for lifting it into the air, standing up like trees, and (if I understand rightly) a horizontal aero-plane which, one would think, would hinder the screws from lifting it, but this too appears only to have been put on paper and never constructed.

Let us now ask ourselves the question why did all these people fail in their experiments? Why did Deeghen have to take to a balloon, and why did the Marquis de Bacqueville break his leg? One reason was because they tried to run before they could walk. We are now just trying to learn to fly, the early experimenters had not even learnt their own ignorance of the subject. But there is a much more important reason, which I should like to dwell on here a little, and that is, that in those days it would have been impossible to fly. The only motive power that the experimenters then had to depend on was the motive power of their own muscles, and we now know that man does not possess sufficient horse-power in proportion to his weight to lift himself in the air, and therefore the problem was impossible on mechanical grounds. Dr. Haughton reckons that men rowing in a boat race exert about one quarter of a horse-power, and if we take a man weighing about 12 stone or 168 lbs. that means that he weighs 672 lbs. per horse-power that he is able to exert. Now Mr. Maxim has proved that heavy birds only weigh 150 lbs. per horse-power that they are capable of exerting; so that they have about four times the horse-power per lb. that we have. The albatross and the vulture probably go up to 250 lbs. per horse-

power. I think you will see that in any case this renders it utterly impossible for a man to navigate the air by his own exertions; but if there is anything more wanted to demonstrate the fact, we might deduce the same result from the experiments of Herr Lilienthal, which I hope to consider later, in which he starts from the top of a hill and goes sailing down through the air under gravity. If instead of sailing in a downward path a man wanted to fly horizontally, *he would have to exert as much horse-power as would enable him to run up the hill carrying the flying machine with him, in the time that the flying machine takes to descend to the bottom.* As the apparatus descends fairly rapidly, you will realize that it would be impossible for a man to run up a hill carrying the weight of the flying machine while Herr Lilienthal was descending, and consequently it would be impossible for a man to drive himself through the air.

But if it is impossible for man to fly by his own exertions we now know that he can construct machines which will produce a far greater horse-power in proportion to their weight than any bird can produce, and for this reason I consider that the problem of flight, at the present time, is entirely different from that which had to be solved in the times of Bacqueville and Pétin and all those amusing old Frenchmen. Mr. Thorneycroft has built a large torpedo-boat destroyer, which exerts one horse-power for every 191 lbs. weight. That weight per horse-power is less than some birds have; but we are not justified in saying that the vessel could fly if it were furnished with wings, for horse-power per lb. or weight per horse-power is not the *only* factor on which the possibility of flight depends. It does not follow that when you increase the size of a bird or of a flying machine the horse-power is directly proportional to the weight. That law of proportionality in fact we know fairly well does not hold. The horse-power must in fact increase more rapidly than it would do if merely proportional to the weight. Assuming that the resistance of the air is proportional to the superficial area and to the square of the velocity, a very simple piece of calculation by elementary mechanics will show that if all the dimensions of an animal be quadrupled it would have to exert double the horse-power per lb., (not double the actual horse-power, but to double the horse-power for every pound of its weight) to sustain itself in flight, so that large animals and large flying machines would require greater horse-power per lb. than small ones.

We will now consider Mr. Maxim's attempts to construct a light and, at the same time, powerful engine, which have led to such successful results from his experiments. Mr. Maxim used steam power and he generates it by a combustion of naphtha. His furnace is provided with a very large number of burners (700 or more) so as to give the largest possible area of flame. The boiler is a water-tube boiler, consisting of of an enormously large number of fine tubes for generating steam in order to get the largest production of steam in the smallest space, and as for the engines they are so light that Mr. Maxim can easily lift them in his hands. The total weight of his machine is about 8,000 lbs., and he reckons that it does not weigh more than 11 lb. per horse-power. Now when you come to think of the birds weighing 150 to 200 lbs. per

horse-power, you will see that Mr. Maxim has certainly got sufficient motive power in proportion to weight; and what is more conclusive is that he has actually been able to make his machine lift itself from the ground. This proves that the purely mechanical difficulties of flight are not insuperable. Moreover, if a large machine, such as Maxim's, will lift itself off the ground, what we have said shows that a smaller machine would have to carry less horse-power per lb. to accomplish a similar feat, and hence experiments made with a rather smaller and consequently more controllable machine might even answer better.

Before Mr. Maxim constructed his machine he, and at the same time, Professor Langley, made a number of experiments on the action of aero-planes moving through the air. Professor Langley was appointed to experiment on the subject by the Smithsonian Institution, of Washington, but Mr. Maxim made similar investigations quite independently at the same time, a whirling table being used in both cases. The principle was this: a plane was made to revolve round a central axis and the force of pressure of the air on it carefully measured so as to discover the laws according to which the resistance of the air varied when the velocity or the inclination of the plane was varied.

The first conclusion that these experiments brought out most prominently may be stated thus:— If a plane be held perfectly horizontally it falls to the ground less quickly if it has a horizontal motion imparted to it (as when made to travel round and round by means of this whirling table) than it would do if it were simply falling vertically. In other words, the horizontal velocity lengthens the time of falling. Let us enquire why this is; let us go back to our old problem of the recoil of a gun, and the result that we deduced therefrom, namely, that in order for a body to support itself in the air it must impart a downward motion to as great a mass of air as possible. There are two ways of getting hold of a great mass of air; one is by constructing an enormously large aero-plane or parachute; but there is another way as well. If we move a plane rapidly through the air in a horizontal direction it will come in contact with a great many different portions of air in succession, and in that way it will act on a far larger mass of air, simply on account of the rate at which it traverses the air. Another argument leads to very much the same result. This dropping plane, you see, imparts a little downward motion to the air as it drops, but as soon as it has got a little distance it comes in contact with fresh particles of air at rest; it is never supported for any length of time by particles to which it has already imparted a perceptible downward velocity; it is, therefore, constantly striking air *at rest*, and accordingly is much more retarded than it would be by ordinarily making its way constantly through the same air that it has set in motion. The ordinary screw propeller of a ship affords another illustration of this point. If a ship is at rest in port and the screw is set in motion, a man can nearly keep the ship from moving by holding it with his hand, and the screw only keeps churning the same portions of water, and so has little power; but as soon as the ship is under way the screw propeller comes in contact with fresh portions of water previously at rest, and so gets a much greater grip on the water than

when the ship was at rest in the harbour. And just the same happens with this aero-plane.

Another result which Professor Langley's and Mr. Maxim's experiments proved was this:—The horse-power required to sustain a given weight in horizontal flight by means of an aero-plane of given dimensions is less for high speeds than for low ones. In other words, the faster the aero-plane travels, the less energy is required to keep it up in the air for the *same* length of time. This fact doubtless accounts for the high speeds at which birds fly, and it depends upon the same principle as the first result, namely, that the more rapidly you drive the plane through the air, the more you bring it into contact with fresh particles of air.

I will now just mention some further points in connection with these experiments. If we take an ideal plane surface going along against the wind, the total pressure is perpendicular to the surface, and by the elementary laws of mechanics we can resolve this force into two components, viz., an upward force, called the *lift*, which *lifts* or supports the weight of the plane, and a horizontal force called the *drift*, which represents the force with which the plane must be *driven*. By making the plane very nearly horizontal, we can decrease the drift to any extent; but if the plane is *perfectly* horizontal and the wind will exert no pressure on it, we shall get no lift or drift at all; so that we cannot do away entirely with the drift; we must have some motive power to support a weight by means of our aero-plane. But, if instead of a plane surface, we experiment with a concave curved surface of the same area, it is found that we get greater lift and less drift, so that it is possible to lift the same weight with less expenditure of horse-power than before. This result holds good provided that the curved surface is inclined at a moderately small angle to the horizon. When the curved surface is brought more nearly vertical, so that its inclination to the horizon is considerable, the reverse is the case; we get greater drift and less lift than with the plane surface. But this is exactly what we want; for in order to stop a flying machine we should have to bring the aero-plane nearly vertical as birds do with their wings. What we want is to check the horizontal speed as much as possible, accordingly we want the drift to be as great as possible, and here again the concave surface is the best.

I have already mentioned that flapping wings are not so well adapted for any mechanical construction as the screw propeller. There is an essential difference between the mechanism of an animal and that of a machine; in the former, continuous rotation is impossible, in the latter it is the simplest form of motion attainable. Mr. Maxim, in a recent lecture, remarked in replying to the question why he did not take the flight of birds as his model, that any man could easily, with a little ingenuity, construct a machine which would walk like a horse or would walk like a man at about four miles an hour; but when we have locomotives that will go 60 miles an hour, there would be no point in doing so. Similarly, when we have screw propellers, which are better adapted to a machine, and which, moreover, have proved so efficacious in the propulsion of ships, there is not much to be gained by trying

flapping wings. You saw M. Pénaud's model bird fly a short distance, but I have here a model which rises by means of a screw, and which the French call a "helicoptère," that is a screw-winged apparatus, and I hope to show you that it will go up to the top of this room. The elastic by which this model is propelled is not so powerful as that in M. Pénaud's bird, but it rises higher, demonstrating conclusively the superiority of the screw propeller.

Another pretty toy of the same kind has an aero-plane in the form of a parachute, which opens out when the apparatus descends; here the screw is beneath the parachute.

Now, probably there are very few people who, if asked what was the best thing to fly with, would select a venetian blind for the purpose; but a Mr. Phillips, who is a very clever engineer, has been led, after a number of elaborate experiments and a good bit of really careful theoretical investigation, to chose something very like one. "Phillips's flying machine" can hardly be strictly called a flying machine, because it has at present only been used in connection with the whirling table, but it has enabled Mr. Phillips to prove that a number of small narrow surfaces will support a greater weight than a large flat surface of the same area. The reason is this: we have already said that success in flying depends upon the quantity of air that the apparatus delivers downwards in order to lift itself upwards; the more air delivered downwards the better; and these successive slats coming into contact with a number of portions of air, *all at rest* at different heights, get a better grip on the air than a single large aero-plane, in which the hinder portion would only come in contact with the air that had already been set in motion downwards by the foremost portion. The machine is driven round by means of a little steam engine working a screw, and the experiments are carried on at Wealdstone, near Harrow, where the apparatus can be seen from the railway. Mr. Phillips has succeeded in lifting the weight of the machine off the ground by this arrangement, and so he finds that he derives a considerably greater lifting force from his structure than from an aero-plane. He spent a considerable amount of time and money on experimenting on large wide planes before coming to the present conclusion.

We will now say a little about Mr. Maxim's machine. This machine, when travelling at about 37 miles an hour, will lift itself off the ground, but in order that there may be no danger of any accident it runs on a railway, and outside that there is an outer railway, so that as soon as it rises a few inches from the ground it presses upwards on the outer rails and is thus prevented from becoming uncontrollable. You see it does not actually travel freely through the air, but it is held down by the outer rails. On one occasion, however, when the engine was developing 362 horse-power, the outer rails were not strong enough, and the machine actually did fly. But that flight was a very expensive one, for it cost nearly £1,000 to repair the machine. After the accident the rails were all torn up, affording proof positive that the machine had sufficient power in proportion to its weight, not only to lift it into the air, but to bend the bars by which the outer wheels were attached and to pull up the rails as well.

Now I feel sure that Mr. Maxim will not mind my saying that I liken his machine somewhat to certain angels that were represented in a beautiful picture in one of the Italian galleries; I believe they were flying down to save a dying child. A clergyman was dilating on the merits of these angels to a party of boys, when another man, who happened to be going through the gallery at the time, remarked—"Sure, Sir, and I see one great defect about those angels." "Indeed," said the clergyman, "what is that?" "Sure, you see the artist has given them enormously large wings to fly with, but he has given them no tails to steer themselves by." (Laughter). Now that represents the position of Mr. Maxim's machine: he has got an enormously large aero-plane to fly with, but he is not yet sufficiently able to control the machine to trust himself in mid air. It is very important that we should do something in learning to control a machine that has completely left the ground, and what Mr. Maxim has not attempted Herr Lilienthal and others have successfully accomplished; that is to say, they have attached themselves to wings and have practised floating down from the top of a hill and balancing themselves in mid air.

Herr Lilienthal had an experimental hill of conical shape, built about 50 feet high, in the neighbourhood of Berlin, in order to try experiments there, so that whatever was the direction of the wind he could practice flying down on the hill side against the wind fairly easily. He runs a few steps down the hill and takes a header into the air. A number of photographs have been taken from the top of the hill and from different points showing Herr Lilienthal in mid air, and these photographs clearly show how difficult it is to balance oneself in the air; in one position he had to sway his legs right forward to prevent the machine tipping over.

Another machine was constructed with flapping tips to the wings, which were to be driven by means of an engine worked by compressed carbonic acid. Herr Lilienthal tried this machine, hoping that by making the wings flap he would be able to sustain himself in the air a little longer; but, unfortunately, the increased size of the machine made it more unmanageable, and the result was that the flappers got broken, and I believe they have not yet been repaired. This year he has, to a certain extent, adopted Phillips's idea of superimposed surfaces; instead of having one wing surface he has two, and he gets much better results; in fact he has actually been able to allow the wind to pick him up, and he has almost succeeded in soaring like the soaring of birds.

One of the most difficult things to learn is how to land with a horizontal speed on. When beginning, one is certain constantly to tumble over forwards; the only way to stop is to get back in the machine and tilt it up in front so as to check the forward movement, thereby imitating the action of birds as revealed by M. Marey's photograph of a pigeon already mentioned. Of course this is very difficult at first.

I will now show two or three paper gliders, in order to illustrate how very difficult this balancing is. I have here one glider consisting of a sheet of paper folded into a V shape and loaded with a light piece of wax at one end. This will go fairly well through the

air, if not loaded too heavily in front, but if the back corners are curled up a little the glider begins to curve up at once, it tips down and up and the result is, that it ends by falling backwards or rolling over and over. I will try it from a slight height; of course it will not glide well, but you will see that the first thing it does is to curve up. We will now turn the corners over the other way and make them curve downwards. You will find that this glider turns downwards at once and soon turns topsy-turvy. I have here another paper glider more resembling a bird in shape which I hope to send across the room, but if it does not it will show you how difficult it is to balance these gliders, it will probably turn a little to one side, I will now try and curve it slightly in the other direction. You saw that I gave only the slightest bend to the paper on the side I wanted it to go, and yet the glider went perfectly straight instead of curving round. This shows what a very little will alter the motion of anything gliding through the air; in fact a friend of mine advised me on no account to throw off gliders in illustration of my lecture because they were certain to go wrong.

What Herr Lilienthal has accomplished in Germany, Mr. Pilcher, of Glasgow, has recently achieved on the Clyde. His machines can be folded up for transport and are very portable; you see they fold up into quite a small space. The first machine Mr. Pilcher constructed was made with very much upturned wings—the wings tipped up considerably, and there was only a vertical rudder, not a horizontal one. But it was found that the machine pitched somewhat in the same way as a paper glider will pitch if its tail is turned too much upwards, so that the machine was rather dangerous to experiment on, because, of course, if a machine with a man on it were to turn over (like gliders have a habit of doing) it would be rather a serious matter. So Mr. Pilcher added a horizontal rudder as well which made it balance much better. He found, however, that although the V shape of the wings made the machine very steady when sailing against a head-wind, a side wind was apt to tip it over, so he had another machine made with the tips of the wings flat instead of being curved up, but the wings were now placed at nearly the height of his head. That, however, did not answer very well as it was very difficult to balance with the weight so far below the wing surface. Accordingly Mr. Pilcher took his first machine and bent the wings quite flat at the tips; and he found that by having the wings so much lower down he could balance much more easily. Of course, if the weight were to be too high up, the equilibrium would be unstable; and elementary considerations might suggest that the stability of the apparatus was greater the lower the centre of gravity. The results of Mr. Pilcher's experiments show that this question of balancing cannot be treated as a mere statical problem, and that it is one of the most important factors in the problem of artificial flight. With the machine in the new modified form, Mr. Pilcher could sustain himself in the air for several seconds, and he was sometimes picked up by the wind and lifted as much as 20 feet above the ground; and when there was not sufficient wind he got someone to pull him along by means of a string, like a kite, or to hold him against the wind. In some cases quite a moderate force was sufficient to hold the machine in mid air. The string could often even be pulled with one finger.

Mr. Pilcher has recently constructed a larger machine with which he proposes to practice in calm weather, and he is hoping to get a small petroleum motor attached in order to try and drive himself along. He says that for an 11 stone man no soaring machine should weigh more than 60 lbs., because it fags one out too soon, and the strain brought on is too severe. Many people seem to think, he says, that a machine can be fully tried in a few hours; as a matter of fact it is only after having handled a machine for several long days for hours at a time that one begins to understand it at all.

To sum up, the question now before us is, shall we fly? Mr. Maxim has shown that the problem is quite different to what it was in the earlier parts of the century; that we can get sufficient motive power in proportion to weight to lift a man into the air, and as he has been successful in this respect with a large machine it follows, from what I said in the early part of my lecture, that a small machine would require to have less horse-power in proportion to its weight for purposes of flight. On the other hand Herr Lilienthal and Mr. Pilcher have shewn that a small machine can be controlled in the air, and that we can, to a certain extent, learn to balance ourselves in the air. What we want now is something half way between these extremes. We want Mr. Maxim to cut down his machine to a moderate size sufficiently small to be controllable; and we want Lilienthal and Pilcher and other experimenters in their direction to learn to control a machine sufficiently large to carry a moderate sized motor. Will Maxim and Lilienthal, coming from opposite directions, meet in the middle? If they do so, if their combined efforts result in the production of a machine whereby a man can rise from the ground, fly over a wall 10 feet high and land safely the other side, then the problem of artificial flight will be solved (applause).

Our only other question is, what will be the uses of flight? It is obvious that in times of peace a flying machine could be used for many purposes. It may be doubted whether it would supersede railway travelling or other existing means of transport for carrying a large number of passengers or heavy goods from place to place, but for carrying light loads from place to place at high speeds, such as important despatches, a flying machine would be of the greatest value—it might even be found useful for carrying mails from one country to another. Moreover, if a machine could be driven through the air at high speed with sufficient fuel to last for a considerable number of hours, it would enable Arctic explorers to fly over the north pole and back even if they did not land there.

But there is another purpose which even now would be easy of accomplishment. If Lilienthal's machine were to come into general use they would afford a very healthy form of exercise. When ladies have lost that enthusiasm for bicycling, which comes of its novelty, and when golf has ceased to be the latest fashion, many of our golf links will be found excellent places for Lilienthal's practice and the exercise will straighten many a back that has got bent double from cycling. Our next question is: what use will these machines be put to in time of war? Of course Mr. Maxim wants to construct a machine that

will carry a ton of dynamite and drop it down into the enemy's fort. But that will only be the first move on the chess-board of the warfare of the future. The second move will be for the defending power to construct a machine which will disable his enemy's machine, and so it is possible that some time in the dim future battles may be fought mainly in the air instead of on land.

I have said very little in this lecture about the means of navigating balloons, because there has been quite sufficient matter to deal with in connection with machines which are heavier than air and which are to be raised by their own energy. I hope to have shown that the problem of flight is worthy of the attention that has been given to it and of the amount of money which has been spent on experiments connected with it. I cannot do better than conclude by quoting a message just received from Mr. Maxim (who was unfortunately unable to be present with us to-day) in which he says: "Tell Dr. Bryan that with the data now at hand successful flight is only a question of time and money."

DISCUSSION.

Mr. Davidson—Mr. Chairman, ladies and gentlemen, I have devoted about twelve years to the subject of flight and of course I believe in the possibility of it. I know that a great number of people now believe in the possibility of flight and that there are a certain number of people who have expended very large sums of money upon experiments.

The first thing to be done in this matter of flight, if we are to obtain it, is to find out what the laws of nature with regard to flight are. We know the laws of nature with regard to travelling over the ground, and we know the laws of nature with regard to travelling through water. Before we can attempt to fly we must find out what the laws of flight are. I feel perfectly convinced in my own mind that I have found out what the laws of flight are (applause). I believe they are absolutely simple. But I would like to point out one thing, balloons may be utterly and entirely put out of the question and so may propellers; propellers are merely fighting against the laws of nature; and everyone will understand that when they find out what the laws of nature are. What we have got to do is to construct a machine which will comply with the laws of nature as regards flight. There is no doubt about it that there are laws of nature which permit of flight or else we should not find birds flying; therefore, what I want to point out is that the main thing we have to find out is the laws of flight, and when we have found them out, to put them into mechanical practice; and I maintain that it is a very simple matter, that any ordinary mechanical engineer will be able eventually to make machines that will fly, with the present up-to-date machinery.

Mr. Maxim's engine, I think he ought to be very much complimented on it—is a marvel of engineering skill; and also Mr. Pilcher's and Herr Lilienthal's; they of course have gone on a small scale, and as the lecturer said, if those two can be brought together we shall have a flying machine, and I certainly agree in that point. But I think with Mr. Maxim, that if he will not come down in size perhaps, but come down to the right principle, there is no doubt about it that we shall have a flying machine in a very short time (applause).

Professor Greenhill—The subject of Dr. Bryan's lecture is one which has always exercised a fascination over the imagination of man from the earliest times, going back to the time of Dædalus, as the lecturer told us, and coming to the

Chinese or Tartar legend of the bronze horse which Milton had in his mind when he spoke of

"Him that left half told
The story of Cambuscan bold.
* * * * *
And of the wondrous horse of brass,
On which the Tartar King did ride."

and Rasselas, Prince of Abyssinia, Dr. Johnson tells us, found a skilful mechanic in the happy valley, who, having constructed a sailing chariot, was encouraged to go on and turned the chariot into a flying machine. But viewed by the careful calculating eye of modern science all these traditional stories of flying machines must appear chimerical. The word chimerical itself suggests some one else's attempts at a flying machine, of which Mr. Maxim, with all the modern appliances of his own unrivalled skill at his disposal, even Mr. Maxim now confesses the problem is far more difficult than he had ever anticipated.

I think Dr. Bryan would prefer to hear the opinions of the artillery talent in the room rather than my remarks on the feasibility of flying machines and their military application to what, in the words of Pope, I may call "The light militia of the lower sky."

Mr. Hollands—Mr. Chairman, ladies and gentlemen, Dr. Bryan has kindly given me the opportunity of making a remark or two, and I may say that I have experimented with models for the last twelve years and I have always employed compressed air as the motive power. I am quite in sympathy with Mr. Davidson as to discarding balloons entirely, but not as to discarding the motor; at any rate in our present state of science, I quite think that the motor is almost absolutely necessary.

REPLY.

Dr. Bryan—I thought Mr. Davidson's point was not that he was going to discard the motor, but that he was going to discard the screw propeller.

Mr. Davidson—Hear, hear.

Dr. Bryan—I am sorry that he did not tell us what he was going to substitute for that screw propeller. If it was flapping wings it seems to me that the great difficulty would be to get the wings sufficiently strong. If he can succeed in securing sufficient rigidity with flapping wings and at the same time to make them flap, I am quite in sympathy with him; and if he can suggest any other means of propulsion which would improve on screw propellers, I am quite in sympathy with him. I only bring forward the screw propellers as the most natural means and as the best known means of mechanical propulsion in a fluid medium, and one which is worthy of a fair trial at anyrate.

There is one other point that I ought to mention, namely, that I have to give my most sincere thanks to the very many friends who have helped me with the preparation of this lecture; in fact I have received so much kind assistance that I find in a certain sense it is not my lecture at all. Mr. Maxim has kindly lent a large number of the slides you have seen; and just before the lecture, Mr. Pilcher, of Glasgow, kindly volunteered to lend those excellent slides both of his and of Lilienthal's experiments which you have seen; Mr. Bennett, of Oxford, (who went all the way to Germany to buy a Lilienthal machine and now has it in his boat-house on the Thames) has given me most valuable help; and among other friends I am much indebted to Mr. Dunell of Chiswick, for kindly putting me in the way of getting much valuable information, and I can only say how grateful I am

to all those who have in several cases, at considerable trouble to themselves, given me so much help in connection with this lecture.

The Chairman—Ladies and gentlemen, I am sure you will allow me to say for you, that to whomsoever the lecturer himself may have been indebted in the making up of his lecture, we are all of us exceedingly indebted to him for the way in which he has taken advantage of and put before us the materials which he says have helped him to make up the lecture. A more interesting lecture, or a more valuable set of photographs, or a lecture that has helped to clear up the subject—to my mind at any rate, and I am sure to yours—could not well be imagined; and, therefore, I am sure I shall express your unanimous feeling by offering to Dr. Bryan our most hearty thanks for the trouble he has taken, and for the most interesting and instructive lecture that we have had (loud applause).

ASTRONOMICAL PROBLEMS.

BY

LIEUTENANT-COLONEL H. H. CROOKENDEN, R.A.

HAVING received a presentation copy of *Thirty Thousand Years of the Earth's Past History* from the Author, Major-General A. W. Drayson, F.R.A.S., late R.A., and further having seen models designed by him practically and ocularly demonstrating the possibility of a second rotation of the Earth, I attempted to solve a few of the problems set by him to enable even a moderate mathematician to determine the obliquity of the ecliptic at any past, present or future date, and to calculate the Declination and Right Ascension of certain fixed stars. The results were in the majority of cases obtained without my knowing how much or how little they differed from the records, as I had no catalogues of stars to refer to to verify my calculations.

Once the theory of the Second Rotation of the Earth is accepted the calculations will be readily understood by anyone acquainted with the solution of spherical triangles, and if the assumptions such as the distance of the Pole of the Ecliptic from the centre of the second rotation, or the distance of the Pole of the Heavens from the same point, are not absolutely correct, they are close approximations to them; Major-General Drayson does not claim that they are mathematically accurate, but the results they give are so near the truth that the calculations of the positions of stars for any dates are much more reliable than the accepted methods can give them by observation and an annual empirical rate + or − of Decl. and R. A.

The calculations which follow have been made from data extracted from the Nautical Almanack for 1887; at that date the refraction tables were the same as those at present in use*; with these data the future positions of certain stars were calculated for 1895, their past

* The refraction tables in 1820 were the same as those used by Bradley and differ by some seconds of angle in small altitudes of stars.

positions in 1820 and 1755 were similarly determined; these dates were taken for the reason that as Major-General Drayson happens to possess copies of the Nautical Almanack for 1820, for 1895 and Bradley's Catalogue for 1755, the differences between the calculated and observed positions can be readily obtained.

It should also be mentioned here that between the years 1833 and 1834 three minutes of arbitrary time were found to have been put into the Nautical Almanack; this correction may be accountable for some of the differences in R.A. as of course Major-General Drayson's time is that of the Nautical Almanack for 1887.

Our standard of Time is at present determined by the interval between successive transits of the 1st point of Aries, but owing to the movement of the Pole of the Heavens and the amount of the obliquity this point precedes its time by a few seconds annually. Were the standard fixed by the interval between successive transits of the centre about which the Pole of the Heavens is moving we should have by these successive transits a uniform standard measure of time, whereas at present we have a variable quantity to give us our standard, for although the movement of the Pole is uniform, the amount of obliquity is changing at a yearly decreasing rate.

In order to determine with accuracy the arc over which the Pole of the Heavens moves annually, the recorded observations of Stars having 0^h and 12^h R.A. for any year are compared with those for, say, 10 years previously so as to get their mean N.P.D.'s. This mean rate for 10 stars was found by General Drayson to be 20″·092 annually. In these problems the movement of the Pole has been taken at 20″·09 and this gives the rate of Precession at 50″·4758 for 1887 $\left(\frac{20''\cdot09}{\text{sin. obliquity}}\right)$; in this case the obliquity has been taken at 23° 27′ 14″·3, the calculated value, and not at the value given in the Nautical Almanack; the difference is not appreciable at the fourth place of decimals.

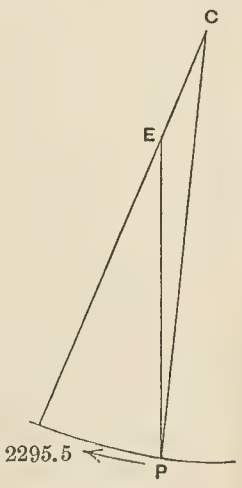
Problem I. Calculate the obliquity on the 1st January, 1887.

$CP = 29°\ 25'\ 47''$. $EC = 6°$.

angle $C = (2295\cdot5 - 1887)\ 40''\cdot9 = 4°\ 38'\ 27''\cdot65$.

log cos C =	9·9985737		29° 25′ 47″
log tan 6° =	9·0216202	1st arc =	5 58′ 49″·69
log tan 1st arc	19·0201939	2nd arc =	23° 26′ 57″·31.
		log cos 2nd arc =	9·96256485
		log cos 6° =	9·9976143
			19·96017915
		− log cos 1st arc =	9·99762987
		log cos EP =	9·96254928

by calculation $EP = 23°\ 27'\ 14''\cdot3$ (Measure of obliquity of the Ecliptic)
by Naut. Alm. $1887 = 23°\ 27'\ 14''\cdot22$
Diff. = 0° 0′ 0″·08.



Problem II. Calculate the obliquity on the 1st January, 1437. See Fig., problem I.

angle $C = (2295{\cdot}5 - 1437)\ 40''{\cdot}9 = 9°\ 45'\ 12''{\cdot}6$

$EC = 6°$ $\quad CP = 29°\ 25'\ 47''$

1st arc $= 5°\ 54'\ 50''$

2nd arc $= 23°\ 30'\ 57''$.

$\log \cos C = 9{\cdot}9936768$

$\log \tan EC = 9{\cdot}0216202$

$\log \tan$ 1st arc $= 19{\cdot}0152970$

$\log \cos$ 2nd arc $= 9{\cdot}9623456$

$\log \cos EC = 9{\cdot}9976143$

$19{\cdot}9599599$

$-\log \cos$ 1st arc $= 9{\cdot}9976825$

$\log \cos EP = 9{\cdot}9622774$.

By calculation $\quad \therefore EP = 23°\ 32'\ 11''{\cdot}5$ $\quad$ (Measure of obliquity in 1437)

Observed by Ulugh Beigh $\quad 23°\ 32'\ 8''$

Diff. $= 0°\ 0'\ 3''{\cdot}5$.

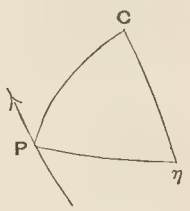
Presumably Ulugh Beigh's result was obtained by taking half the difference of the sun's altitude at the winter and summer solstices, his instruments were probably not very accurate, nor was refraction corrected for.

Problem III. As an example of the accuracy which can be obtained by calculation as regards the past or future position of the stars, the following example is given :

In the Nautical Almanack for 1887 for the star η Ursae Majoris we have

mean R.A. $= 13^h\ 43^m\ 5^s{\cdot}226$

do. Decl. $= 49°\ 52'\ 38''{\cdot}76$.



Then in the triangle $CP\eta$ we have

C, pole of 2nd rotation.
P, pole of daily rotation.
η, the star.

The point C being on the line of no variation in R. A. must have a R. A. $= 18$ hrs.

Then angle $P = 18^h - 13^h\ 43^m\ 5^s{\cdot}226 = 4^h\ 16^m\ 54^s{\cdot}774$
$= 64°\ 13'\ 41''{\cdot}6$; $\quad P\eta = 90° - 49°\ 52'\ 38''{\cdot}76$

$\log \cos P = 9{\cdot}6382754$ $\quad = 40°\ 7'\ 21''{\cdot}24$

$\log \tan CP = 9{\cdot}7513982$ $\quad$ 1st arc $= 13°\ 46'\ 54''{\cdot}4$

$\log \tan$ 1st arc $= 19{\cdot}3896736$ $\quad$ 2nd arc $= 26°\ 20'\ 26''{\cdot}84$

$\log \sin P = 9{\cdot}9544996$ $\quad \log \cos$ 2nd arc $= 9{\cdot}9523908$

$\log \sin P\eta = 9{\cdot}8091723$ $\quad \log \cos CP = 9{\cdot}9399977$

$19{\cdot}7636719$ $\quad 19{\cdot}8923885$

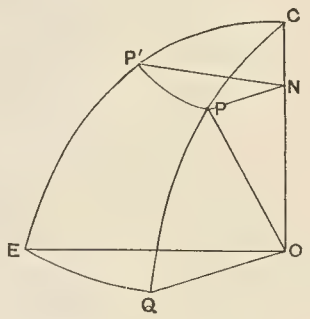
$-\log \sin C\eta = 9{\cdot}7745753$ $\quad -\log \cos$ 1st arc $= 9{\cdot}9873129$

$\log \sin C = 9{\cdot}9890966$ $\quad \log \cos C\eta = 9{\cdot}9050756$

$\therefore C = 77°\ 12'\ 53''$. $\quad \therefore C\eta = 36°\ 31'\ 6''$.

If the star η Ursae Majoris has no "proper motion," we can calculate the R. A. and N. P. D. for any date past or future without reference to its annual rate of variation, hence no further observations are required to determine its position. If it has a "proper motion" the exact amount and direction of this can be ascertained by a comparison of its calculated and its observed positions.

Let P and P' be two positions of the Pole of the Heavens, C the centre of 2nd rotation. $CE = CQ = 90°$. Then the arc EQ measures the angle PCP', O being the centre of the great sphere.



Then $$EQ = \frac{PP' \cdot QO}{PN} = \frac{PP' \cdot PO}{PN},$$

$$\therefore \text{ angle } PCP' = \frac{\frac{PP'}{PN}}{PO} = \frac{PP'}{\sin COP};$$

but annual movement of $P = 20''{\cdot}09$
and angle $COP = 29°\ 25'\ 47''$.

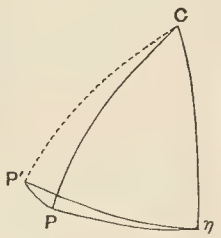
$$\log 20{\cdot}09 = 11{\cdot}3029799 \quad \text{(10 added to characteristic)}$$
$$-\log \sin 29°\ 25'\ 47'' = \underline{9{\cdot}6913959}$$
$$\log EQ \text{ (angle } PCP') = 1{\cdot}6115840,$$

whence the angle $PCP' = 40''{\cdot}886$ annual variation of PCP' for simplicity's sake taken at $40''{\cdot}9$ in all these problems.

Problem IV.

Without further information about the star η Ursae Majoris beyond that known on the 1st January 1887, the calculator now proceeds to find the N. P. D. of this star for the 1st January 1895.

$$77°\ 12'\ 53''.$$
Variation of angle $C = 8 \times 40''{\cdot}9 = 5'\ 27''{\cdot}2$;
$\therefore$ the angle $P'C\eta = 77°\ 18'\ 20''{\cdot}2$ on 1. 1. 95.



$\log \cos P'C\eta = 9{\cdot}3419302$ $\quad C\eta = 36°\ 31'\ 6''$
$\log \tan P'C = 9{\cdot}7513982$ $\quad$ 1st arc $= 7°\ 4'\ 1''{\cdot}5$
$\log \tan$ 1st arc $= 19{\cdot}0933284$ $\quad$ 2nd arc $= 29°\ 27'\ 4''{\cdot}5$

$$\log \cos \text{ 2nd arc} = 9{\cdot}9399062$$
$$\log \cos CP' = \underline{9{\cdot}9399977}$$
$$19{\cdot}8799039$$
$$-\log \cos \text{ 1st arc} = \underline{9{\cdot}9966880}$$
$$\log \cos P'\eta = 9{\cdot}8832159.$$

By calculation $\quad \therefore P'\eta = 40°\ 9'\ 45''{\cdot}87$
given in Naut. Alm. $\quad 40°\ 9'\ 45''{\cdot}61$

Diff. $= 0°\ 0'\ 0''{\cdot}26.$

Similarly we can calculate the N. P. D. for the same star for the 1st January 1755, 132 years before 1887.

$$132 \times 40''{\cdot}9 = 1°\ 29'\ 59''.$$
$$\therefore \text{ angle } P'C\eta = 77°\ 12'\ 53'' - 1°\ 29'\ 59''$$
$$= 75°\ 42'\ 54''.$$

log cos C = 9·3922489	$C\eta$ = 36° 31′ 6″
log tan CP' = 9·7513982	1st arc = 7° 55′ 29″·2
log tan 1st arc = 19·1436471	2nd arc = 28° 35′ 36″·8

log cos 2nd arc = 9·9435133
log cos CP' = 9·9399977
19·8835110
− log cos 1st arc = 9·9958325
log cos $P'\eta$ = 9·8876785.

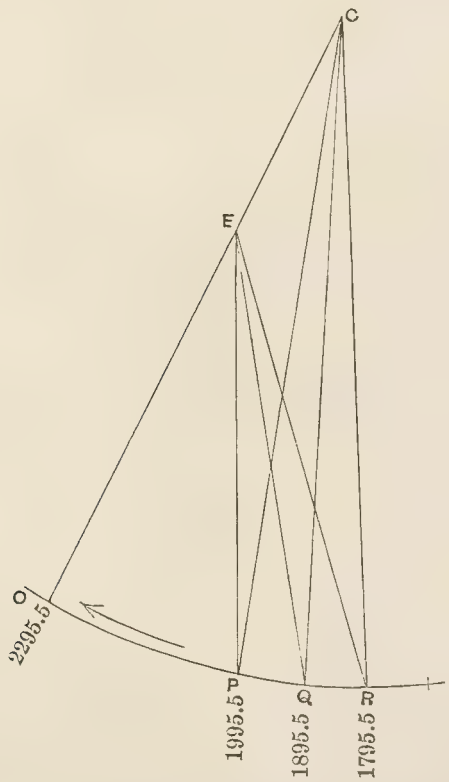
	$\therefore$ $P'\eta$ = 39° 27′ 22″·9
By calculation in Bradley's Catalogue	= 39° 27′ 21″
	Diff. = 0° 0′ 1″·9.

N.B. Bradley's refraction corrections differed from those now used; had he used our present tables, the results would have agreed within 1″.

Right Ascension.

Problem V.

To calculate the R. A.'s of stars it will be necessary to determine the values of the angles CRE, CQE, CPE at the periods mentioned in



the Fig. because the transit of C precedes the transit of E by the interval of time measured by those respective angles. The transits

of C are uniform and E gains on C, this rate of decrease in the angle subtended by EC with the successive positions of the Pole of the Heavens can be calculated.

Thus angle $ECP = 3^\circ\ 24'\ 30''$ $(300 \times 40''{\cdot}9)$
$CP = 29^\circ\ 25'\ 47''$
$EC = 6^\circ$.

And by calculations similar to those on pp. 512 and 513 we get

$$EP = 23^\circ\ 26'\ 33''{\cdot}3.$$

$$\sin P = \frac{\sin C \,.\, \sin EC}{\sin EP},$$

$\therefore$ log sin C = 8·7741633
log sin EC = 9·0192346
17·7933979
$-$ log sin EP = 9·5996974
log sin P = 8·1937005.

angle $P = 0^\circ\ 53'\ 42''{\cdot}13$.

Similarly in the triangle ECR.

$ER = 23^\circ\ 27'\ 58''$ and angle $R = 1^\circ\ 29'\ 21''$
subtract angle P = $53'\ 42''$
rate of decrease in 200 years = $35'\ 59''$
$= 2159''$
in 100 years $= 1079''$.

Convert this into time by dividing by 15 and we get the annual rate $= {}^{s}{\cdot}719$*.

When any date is fixed upon as a zero the allowance thus found of ${}^{s}{\cdot}719$ per year must be made to find the recorded R. A. as at present used by astronomers.

Let 1st January 1887 be the zero date, then for dates after 1887 the allowance will be $-$, for earlier dates $+$, for as the Pole of the Heavens advances, R. A. will increase for all stars except a few circumpolar ones of which a list can be easily made out.

Problem VI. Calculate the R. A. of η Ursae Majoris for 1st January 1895, from data obtained on 1st January 1887.

We have already seen that the N. P. D. of this star was found to be (page 514)

$$= 40^\circ\ 9'\ 45''{\cdot}87.$$

$C\eta = 36^\circ\ 31'\ 6''$ and angle $C = 77^\circ\ 18'\ 20''{\cdot}2$,

$$\text{then } \sin P = \sin C\, \frac{\sin C\eta}{\sin P\eta}$$

log sin C = 9·9892521
log sin $C\eta$ = 9·7745740
19·7638261
$-$ log sin $P\eta$ = 9·8095335
log sin P = 9·9542926

whence $P = 64^\circ\ 10'\ 18''$
$= 4^h\ 16^m\ 41^s{\cdot}2$
$-8 \times {\cdot}719 = 5^s{\cdot}7$
R. A. $= 18^h - 4^h\ 16^m\ 35^s{\cdot}5$

* Another way of getting the rate after 1995 is to divide the value of angle P by 300×15 to get the answer in Time, this comes out ${}^{s}{\cdot}716$ per year; the rate is of course a decreasing one.

R. A. by calculation = $13^h\ 43^m\ 24^s{\cdot}5$
recorded in Naut. Alm. = $13^h\ 43^m\ 24^s{\cdot}22$
Difference = $0^h\ 0^m\ 0^s{\cdot}28$.

Problem VII. Calculate the R. A. of the same star for 1st January 1820 from recorded data 1st January 1887.

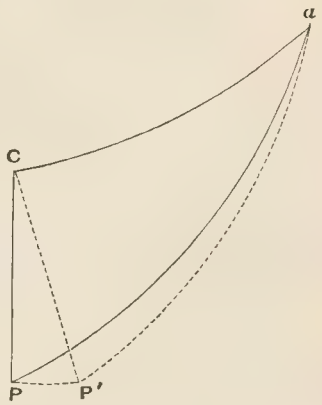
Then similarly we obtain

angle $P = 64°\ 41'\ 53''{\cdot}4 =$ $4^h\ 18^m\ 47^s{\cdot}5$
$+67 \times {\cdot}719 =$ $48^s{\cdot}17$
R. A. by calculation $= 18^h -$ $4^h\ 19^m\ 35^s{\cdot}67$
$=$ $13^h\ 40^m\ 24^s{\cdot}33$
recorded in Naut. Alm. 1820 $13^h\ 40^m\ 26^s{\cdot}43$
Difference = $0^h\ 0^m\ 2^s{\cdot}10$.

Problem VIII. Calculate the R. A. and Decl. of Spica (α Virginis) for 1st January 1820 from data given in the Nautical Almanack for 1st January 1887.

1. 1. 87 α Virginis

R.A. $= 13^h\ 19^m\ 14^s{\cdot}35$
Decl. $= 10°\ 34'\ 16''{\cdot}3$ S.



angle $P = 18^h - 13^h\ 19^m\ 14^s{\cdot}35$ and N.P.D.
$= 70°\ 11'\ 24''{\cdot}75$; $(Pa) = 100°\ 34'\ 16''{\cdot}3$.
$CP = 29°\ 25'\ 47''$.

$\log \cos P =$ 9·5300700
$\log \tan PC =$ 9·7513982
$\log \tan$ 1st arc $=$ 19·2814682

$100°\ 34'\ 16''{\cdot}3$
1st arc $10°\ 49'\ 26''$
2nd arc $= 89°\ 44'\ 50''{\cdot}3$

$\sin C = \sin P \dfrac{\sin Pa}{\sin Ca}$

$\log \sin P =$ 9·97350786
$\log \sin Pa =$ 9·99256574
19·9660736
$-\log \sin Ca =$ 9·9999967
$\log \sin C =$ 9·9660769

$\log \cos$ 2nd arc $=$ 7·6444710
$\log \cos CP =$ 9·9399977
17·5844687
$-\log \cos$ 1st arc $=$ 9·9922039
$\log \cos Ca =$ 7·5922648
$\therefore Ca = 89°\ 46'\ 33''{\cdot}3$.

$40''{\cdot}9$
67
286 3
2454
$2740''{\cdot}3$
$= 45'\ 40''{\cdot}3$

$C = 180° - 67°\ 38'\ 51''$
$= 112°\ 21'\ 9''$
$- \quad 45'\ 40''{\cdot}3$
angle $C = 111°\ 35'\ 28''{\cdot}7$ on 1. 1. 20.

If P' be the position of the pole on 1. 1. 20, then in the triangle $CP'\alpha$ we have to find $P'\alpha$, the N.P.D. of α at that date, and so get the Decl. required.

In the triangle $CP'\alpha$ we now have

the angle C	$111° 35' 28''{\cdot}7$	$C\alpha$	$89° 46' 33''{\cdot}3$
CP'	$29° 25' 47''$	1st arc	$11° 43' 40''{\cdot}77$*
log cos C	$9{\cdot}56582828$	2nd arc	$101° 30' 14''{\cdot}07$
log tan $P'C$	$9{\cdot}75139824$		
log tan 1st arc	$19{\cdot}31722652$	log cos 2nd arc	$9{\cdot}2998009$
$\sin P' = \sin C \frac{\sin C\alpha}{\sin P'\alpha}$		log cos CP'	$9{\cdot}9399977$
			$19{\cdot}2397986$
log sin C	$9{\cdot}9684044$	$-$log cos 1st arc	$9{\cdot}9908376$
log sin $C\alpha$	$9{\cdot}9999967$	log cos $P'\alpha$	$9{\cdot}2489610$
	$19{\cdot}9684011$	$P'\alpha$	$180° - 79° 46' 53''{\cdot}3$
$-$log sin $P'\alpha$	$9{\cdot}9930562$	N.P.D. in 1820	$100° 13' 6''{\cdot}7$
log sin P'	$9{\cdot}9753449$	Decl.	$10° 13' 6''{\cdot}7$ S.
$\therefore P'$	$70° 52' 33''$	From Naut. Alm.	$10° 13' 3''{\cdot}3$
	$= 4^h 43^m 30^s{\cdot}2$	Diff.	$0° 0' 3''{\cdot}4$
add. $^s{\cdot}719 \times 67$	48^s		
R.A. $= 18^h -$	$4^h 43^m 18^s{\cdot}2$		
$=$	$13^h 16^m 41^s{\cdot}8$	by calculation	
	$13^h 16^m 43^s{\cdot}46$	from Naut. Alm.	
Diff. $=$	$0^h 0^m 1^s{\cdot}66$.		

Problem IX. Calculate the R. A. and N. P. D. of Pollux

(β Geminorum) for 1. 1. 95 from data given in the Nautical Almanack on 1. 1. 87.

* The angle C being greater than 90° the 1st arc must be added.

1. 1. 87 β Geminorum R.A. = $7^h\ 38^m\ 24^s$

N.P.D. = 61° 42′ 6″·6

1st arc = 27° 9′ 20″ angle $P > 90°$

2nd arc = 88° 51′ 26″·6

angle P = 155° 24′

$P\beta$ = 61° 42′ 6″·6

PC = 29° 25′ 47″

log cos P = 9·9586767

log tan PC = 9·7513982

log tan 1st arc = 19·7100749

log sin P = 9·6193864

log sin $P\beta$ = 9·9447257

19·5641121

− log sin $C\beta$ = 9·9999172

log sin C = 9·5641949

log cos 2nd arc = 8·2997467

log cos CP = 9·9399977

18·2397444

− log cos 1st arc = 9·9492781

log cos $C\beta$ = 8·2904663

1. 1. 87 { $C\beta$ = 88° 52′ 52″·4
angle C = 21° 30′ 22″·3

40″·9 × 8 + 5′ 27″·2

1. 1. 95 angle C = 21° 35′ 49″·5

log cos C = 9·9683873

log tan PC = 9·7513982

log tan 1st arc = 19·7197855

$C\beta$ = 88° 52′ 53″·4

1st arc = 27° 40′ 45″

log cos 2nd arc = 61° 12′ 8″·4 = 9·6827928

log cos CP = 9·9399977

19·6227905

− log cos 1st arc = 9·9472193

log cos $P\beta$ = 9·6755712

$P\beta$ = 61° 43′ 13″·6 by calculation

61° 43′ 13″·7 by Naut. Alm.

log sin C = 9·5659390

log sin $C\beta$ = 9·9999197

19·5658587

− log sin $P\beta$ = 9·9448016

log sin P = 9·6210571

$\therefore$ P = 180° − 24° 42′ 4″

= 155° 17′ 56″

or $10^h\ 21^m\ 11^s·7$

$-8 \times {}^s·719$ $5^s·6$

R.A. of β $18^h - 10^h\ 21^m\ 6^s·1$

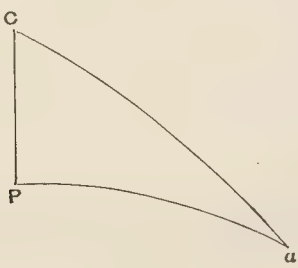
1. 1. 95 $7^h\ 38^m\ 53^s·9$ by calculation

$7^h\ 38^m\ 53^s·44$ by Naut. Alm.

Diff. $0^h\ 0^m\ 0^s·46$.

Problem X. On 1. 1. 87 a Ursae Majoris by Nautical Almanack,

R.A. = $10^h\ 56^m\ 44^s·83$; Decl. = 62° 21′ 38″·4.



Required N. P. D. and R. A. of this star 1st January 1896, 1820 and 1755.

angle $P = 18^h - 10^h\ 56^m\ 44^s{\cdot}83 = 105°\ 48'\ 47''{\cdot}5$ $\quad Pa = 27°\ 38'\ 21''{\cdot}6$

$\log\cos P = 9{\cdot}4353694$
$\log\tan Pa = 9{\cdot}7190508$
$\log\tan$ 1st arc $= 19{\cdot}1544202$

$PC = 29°\ 25'\ 47''$
1st arc $= 8°\ 7'\ 16''$ $\quad$ angle $P > 90°$
2nd arc $= 37°\ 33'\ 3''$

$\log\sin P = 9{\cdot}9832452$
$\log\sin Pa = 9{\cdot}6664280$
$19{\cdot}6496732$
$-\log\sin Ca = 9{\cdot}8480349$
$\log\sin C = 9{\cdot}8016383$

$\log\cos$ 2nd arc $= 9{\cdot}8991707$
$\log\cos Pa = 9{\cdot}9473776$
$19{\cdot}8465483$
$-\log\cos$ 1st arc $= 9{\cdot}9956228$
$\log\cos Ca = 9{\cdot}8509255.$

(1896—1887) $40''{\cdot}9 = 0°\ 6'\ 8''{\cdot}1.$

On 1. 1. 87 $\begin{cases} Ca = 44°\ 48'\ 33''{\cdot}6 \\ C = 39°\ 17'\ 49''{\cdot}6 \end{cases}$
$6'\ 8''{\cdot}1$
On 1. 1. 96 $C = 39°\ 23'\ 57''{\cdot}7.$

$\log\sin C = 9{\cdot}8025836$
$\log\sin Ca = 9{\cdot}8480349$
$19{\cdot}6506185$
$-\log\sin Pa = 9{\cdot}6671265$
$\log\sin P = 9{\cdot}9834920$

$\log\cos C = 9{\cdot}8880338$
$\log\tan PC = 9{\cdot}7513982$
$\log\tan$ 1st arc $= 19{\cdot}6394320$

$44°\ 48'\ 33''{\cdot}6$
1st arc $= 23°\ 33'\ 16''{\cdot}6$
2nd arc $= 21°\ 15'\ 17''$

$P = 105°\ 41'\ 52''$; $(180° - 74°\ 18'\ 8'')$
$= 7^h\ 2^m\ 47^s{\cdot}5$
$-9 \times {\cdot}719 \quad 6^s{\cdot}4$
R.A. $= 18^h - 7^h\ 2^m\ 41^s{\cdot}1 = 10^h\ 57^m\ 18^s{\cdot}9$
By Naut. Alm. $= 10^h\ 57^m\ 18^s{\cdot}6$
Diff. $= 0^h\ 0^m\ 0^s{\cdot}3$

$\log\cos$ 2nd arc $= 9{\cdot}9694057$
$\log\cos PC = 9{\cdot}9399977$
$19{\cdot}9094034$
$-\log\cos$ 1st arc $= 9{\cdot}9622177$
$\log\cos Pa = 9{\cdot}9471857$

Calculated $Pa = 27°\ 41'\ 15''{\cdot}4$
By Naut. Alm. $= 27°\ 41'\ 15''{\cdot}65$
Diff. $0°\ 0'\ 0''{\cdot}25$

On 1. 1. 87 angle $C = 39°\ 17'\ 49''{\cdot}6$
$-40''{\cdot}9 \times 67 = 45'\ 40''{\cdot}3$
On 1. 1. 20 angle $C = 38°\ 32'\ 9''{\cdot}3$

$\log\cos C = 9{\cdot}8933277$
$\log\tan CP = 9{\cdot}7513982$
$\log\tan$ 1st arc $= 19{\cdot}6447259$

$\log\sin C = 9{\cdot}7944916$
$\log\sin Ca = 9{\cdot}8480349$
$19{\cdot}6425265$
$-\log\sin Pa = 9{\cdot}6611912$
$\log\sin P = 9{\cdot}9813353$

$P = 180° - 73°\ 19'\ 19''{\cdot}7$
$= 7^h\ 6^m\ 42^s{\cdot}72$
$+67 \times {}^s{\cdot}719 = 48^s{\cdot}17$
R.A. $= 18^h - 7^h\ 7^m\ 30^s{\cdot}89$
$= 10^h\ 52^m\ 29^s{\cdot}11$
by Naut. Alm. $10^h\ 52^m\ 31^s{\cdot}99$
Diff. in 67 years $0^h\ 0^m\ 2^s{\cdot}88.$

$Ca = 44°\ 48'\ 33''{\cdot}6$
1st arc $= 23°\ 48'\ 41''{\cdot}3$
2nd arc $= 20°\ 59'\ 52''{\cdot}3$

$\log\cos$ 2nd arc $= 9{\cdot}9701579$
$\log\cos CP = 9{\cdot}9399977$
$19{\cdot}9101556$
$-\log\cos$ 1st arc $= 9{\cdot}9613636$
$\log\cos Pa = 9{\cdot}9487920$

Calculated $Pa = 27°\ 16'\ 48''{\cdot}88$
by Naut. Alm. $= 27°\ 16'\ 46''{\cdot}6$
Difference $= 0°\ 0'\ 2''{\cdot}28$

By a similar process for 1. 1. 1755 we obtain

angle $C = 37° 47' 50''·8$;

log cos C = 9·8977273
log tan PC = 9·7513982
log tan 1st arc = 19·6491255

log sin C = 9·7873892
log sin Ca = 9·8480349
19·6354241
− log sin Pa = 9·6560536
log sin P = 9·9793705

$P = 180° - 72° 28' 46''$
$= 7^h 10^m 4^s·9$
$+ ·719 \times 132 = 1^m 34^s·9$
R.A. $= 18^h - 7^h 11^m 39^s·8$
$= 10^h 48^m 20^s·2$
By Bradley $10^h 48^m 22^s·6$
Diff. $0^h 0^m 2^s·4$

$Ca = 44° 48' 33''·6$
1st arc $= 24° 1' 35''·8$
2nd arc $= 20° 46' 57''·8$

log cos 2nd arc = 9·9707804
log cos CP = 9·9399977
19·9107781
− log cos 1st arc = 9·9606402
log cos Pa = 9·9501379

$Pa = 26° 56' 0''$
By Bradley $= 26° 55' 58''·6$
Diff. = $0° 0' 1''·4$

It would be tedious to give any further examples of calculations such as those already given, the principle in each case is the same. The constants (angular distance from C and the angle at C formed by P and the star) being once established for any year, say 1887, the past or future position of the star can be worked out in a quarter of an hour to within a fraction of a second of what is recorded as the true position of the star in the Nautical Almanack; the log tan of CP and the log cos of the same arc will recur so frequently that it will hardly be necessary to look them out for every calculation, they will most probably very soon be committed to memory.

In dealing with some of the circumpolar stars such as λ Ursae Minoris there are two or three points to be noted.

On the 1st January 1887 this star is assigned

R.A. $= 19^h 36^m 46^s·88$ and Decl. $= 88° 57' 36''·5$;

the constants are found to be on this date

angle $C = 0° 53' 37''$ and $C\lambda = 28° 29' 2''·5$
$CP = 29° 25' 47''$.

If a figure be constructed it will be seen that for years later than 1887 the R. A. will decrease, therefore the value of $^s·719$ per year will have to be added, see page 516; the change in R. A. is very great and the rate very variable.

This star is a very difficult one to work out because the angle at C is so small that the cosines are closely approximating to unity, a difference in the 7th place of decimals will cause a difference of several

seconds in the N. P. D. and hence in the R. A. Logarithm tables to 9 or 10 places would be desirable for working out such a problem.

My own calculations came out as follows, as compared with the records in the Nautical Almanack for 1st January 1895:

	R. A.	Decl.
Naut. Alm.	$19^h\ 28^m\ 5^s{\cdot}4$	$88°\ 59'\ 39''{\cdot}3$
Own	$19^h\ 28^m\ 4^s{\cdot}104$	$88°\ 59'\ 40''.$
Diff.	$0^h\ 0^m\ 0^s{\cdot}296$	$0°\ 0'\ 1''{\cdot}3$

THE KASHMIR IMPERIAL SERVICE ARTILLERY.

BY

LIEUTENANT G. F. MACMUNN, D.S.O., R.A.

THE share which a section of a Kashmir Mountain battery had in Colonel Kelly's advance over the snows to the relief of Chitral may, perhaps, render an account of the Kashmir Artillery of interest to readers of these "Proceedings."

Before however describing the Kashmir forces it may be of interest to give an outline of that large auxiliary force, of which they form a part, the Imperial Service Troops, which, during the last eight years, has been growing up almost unheeded by the public and even by the army in India and at home.

During and after the Russian War scare of some ten years back, almost all the princes of India, following the lead of the Nizam of Hyderabad, offered large sums of money to be expended in the defence of India. This offer was not accepted as it stood, but it was arranged that each State should set apart a portion of its troops for the service of the Empire, in return for which the Indian Government was to furnish arms and a portion of the equipment, and would depute officers to train and inspect the various corps. Accordingly a beginning was made under Colonel H. Melliss, C.S.I., who was appointed chief inspecting officer with a staff of inspecting officers and their assistants under him.

The force rapidly progressed and grew till it now numbers close on 20,000 men, cavalry, artillery, infantry, camel corps, sappers and transport trains. The chief inspecting officer was appointed Inspector-General of Imperial Service Troops, and a D.A.A.G. of musketry for the force was appointed, who presides over an annual rifle meeting for these troops at Meerut.

The corps, which are all now equipped with the Martini-Henry arms, are modelled on the cavalry and infantry regiments of the Indian Army. The command is exercised entirely by the native commandants, under the military organization of the States they are serving. The inspecting officers, once the corps in their circles are trained and organized, only inspect the corps from time to time, conferring with the various durbars on their requirements.

The corps themselves are all very completely and smartly clothed and equipped and present a very soldierly appearance. They are not as yet in any way under the commander-in-chief in India, save when

associated with Indian troops in the field. All details connected with their equipment and organization are arranged by the Inspector-General with the durbars on one hand and the Government on the other.

The force is very strong in cavalry, and affords an honourable career to many men of family in the various States, to whom a military career is traditional, but who find little vent in the peaceful India of to-day. Some of the material from which the Imperial Service Corps are recruited is equal to the best in India, and it is very distinctly laid down that only subjects of a ruler shall serve in any of his corps; no aliens, with a few exceptions, being allowed to enlist. The reason of this is that it is important that in the event of trouble the armies of native States shall follow the lead of their chief. During the mutiny many of the native State contingents revolted when their rulers remained staunch, and in almost every case these contingents were recruited from races not subject to the State they served, and were for the most part of similar constitution to the Bengal Army with whom they threw in their lot. For this reason great stress is laid on the Imperial Service Corps enlisting men from their own State only.

The movement when first started met with much opposition, chiefly from men who knew India when the native States and their armies were a source of considerable anxiety. There are, of course, many good arguments both for and against the movement, which however was approved by Lord Roberts, and the present organization was gradually developed, entailing in many States the very satisfactory result of the reduction of many of the undisciplined irregular corps, into which the armies of De Boigne and his contemporaries had degenerated.

The "Imperial Service" system is undoubtedly the policy of a strong Government, confident in the loyalty of the native chiefs and in its own power to preserve that loyalty.

The Kashmir army, to describe the artillery of which is the object of this article, is now the remnant of a very large force maintained by the Maharajah Gulab Singh to defend his Punjab frontier and hold the various distant districts of Ladakh, Skardu and Gilgit, which he proceeded to overrun.

In 1888, when the present Maharajah Pratab Singh made his offer of troops for Imperial defence, most of the old cadres remained and these with many corps of militia amounted to a very considerable number, far above that which the resources and military needs of his State could warrant.

So, shortly after his offer of troops was made, the Kashmir army generally was gradually reduced to a strength of 3 squadrons of cavalry, 4 batteries of artillery, 9 battalions of infantry and some sappers and miners. Of these, 6 battalions of infantry, 2 Mountain batteries and 2 squadrons of cavalry were organized as Imperial Service Troops and armed by the Indian Government. The remainder forming what is called their regular army with obsolete armament and little training is only maintained for the purposes of guards, ceremonial and the garrisoning of unimportant frontier stations in Skardu and Ladakh. Perhaps its most efficient corps is a battery of Horse Artillery, who

with old and obsolete equipment and old horses contrive to make a very creditable appearance.

Of the Imperial Service force, 3 battalions and 1 Mountain battery serve always in the Gilgit district and the remainder at Jammoo, the Maharajah's capital.

The Kashmir Imperial Service artillery consists of 2 Mountain batteries, armed with 4 guns each of 7-prs. R.M.L. of 200 lbs., clothed, equipped and organized exactly as the native Mountain batteries of the Indian Army.

Their history is as follows:—The Maharajah's offers of troops included artillery and, as we were then beginning to look anxiously to the Pamir passes into Gilgit and had revived the British agency in that district, it was decided to stiffen with a certain amount of equipment one of the old Mountain batteries such as they were, of which many existed in the Kashmir Army for service on the Gilgit frontier.

Captain C. W. Brownlow, R.A. was deputed to report on the state of the Kashmir battery (No. 1) and its requirements to bring it to any sort of efficiency, a smart native officer from No. 4 Hazara Mountain battery having been attached to it, while an R.A. officer was sent to Jammu for three months to supervise the training of the battery prior to its moving to Gilgit.

It was armed with old bronze 7-prs. of 224 lbs., which had been given to the Maharajah some years before by Government and at this period only a few essentials in the way of equipment were issued.

No. 1 Mountain battery finally proceeded to Gilgit in time for a portion of it to take part in Colonel Durand's successful campaign against Hunza and Nagyr. During and after this campaign it was found that an effective artillery cannot be maintained on the "catch 'em alive oh" system, and it was decided to thoroughly equip and remodel another Mountain battery to relieve No. 1 at Gilgit. An artillery inspecting officer was appointed to Colonel Melliss' staff to advise on and superintend artillery affairs and No. 2 Kashmir Mountain battery was thoroughly organized and received an almost complete equipment as detailed for native Mountain batteries in India. In 1892 No. 2 Mountain battery accordingly marched to Gilgit, complete and very well muled, save that all the mules, bought by the inspecting officer, were necessarily full young for immediate hard work.

No. 1 Mountain battery, on its return from Gilgit, was practically disbanded, all its very old soldiers, of whom there were many, discharged, its mules got rid of and its old guns, found too unwieldy for field work, distributed in the forts in the Gilgit district. In the autumn of 1893 a new equipment with the 7-pr. of 200 lbs. was drawn from the Rawal Pindi Arsenal and the reformation of the battery was commenced under Captain R. A. Kaye's supervision. In May 1894 the battery, of whom officers, mules and men with a few exceptions had never marched before, proceeded to Gilgit *viâ* Kashmir, relieving No. 2 Mountain battery, which returned to Jammu, near Sialkot in the Punjab. In 1895 the right section of No. 1 Kashmir Mountain battery formed a portion of Colonel Kelly's force in his long forced

march to Chitral, which Lieutenant C. G. Stewart, D.S.O., R.A. has described in these pages.

The Mountain batteries are now fully equipped and resemble in every detail our own Mountain batteries and draw and replenish their equipment from Rawal Pindi Arsenal. They are composed almost entirely of Dogras, the right half battery being Hindus, the left half battery Muhamadans. The commanding officer is styled the commandant (a rank) and wears lieut.-colonel's badges, with the object of making him equal in rank to the commandants of regiments (a very praiseworthy object!) an old custom in the Dogra army. He has under him his captain (subahdar) and two subalterns (jemadars.) The officers have often direct commissions but may be promoted from the ranks.

The batteries receive prizes for skill-at-arms and practice annually on similar scale and under similar rules to native batteries in India. Their shooting and fire discipline is very fair, and in the season 1895-96 they shot at competitive practice under the rules laid down for batteries armed with the 7-pr. and made very respectable scores.

The Royal Artillery officer on Colonel Melliss's staff is styled Assistant Inspecting Officer Imperial Service Artillery and has his headquarters at Jammu. He advises the Kashmir authorities on artillery subjects and under the Inspector-General of Imperial Service Troops arranges all matters relating to the organization, pay, equipment, etc. of the two Mountain batteries and purchases their remounts and also inspects and superintends the training of the Mountain battery stationed at Jammoo.

The battery in the Gilgit district is supervised by the Royal Artillery officer on the British Gilgit agent's staff; he becomes C.R.A. in the event of service and superintends all artillery matters in the agency.

The assisting inspecting officer at Jammoo and the R.A. officer at Gilgit submit confidential reports to the Inspector-General of Imperial Service Troops on the batteries under their inspection every six months.

As the object of the Imperial Service system is to train the native commandants to be self-reliant, the better the commandants of the Mountain batteries can "run their own shows" in every way, the better the R.A. officers connected with them have done their work.

The equipment is issued, however, to the assistant inspecting officer, who keeps the ledgers and conducts all correspondence on this subject. Everything else, such as pay, clothing, discipline, rations, is run by the commandants, who also, of course, have the actual charge of the equipment, the assistant inspecting officer having free access to inspect the offices and check irregularity in routine.

Some of the officers and non-commissioned officers have attended the Mountain artillery practice camp near Rawal Pindi the last two years, with the result that they have much improved their ideas on what a battery should be and are filled with zeal to shoot well. It is hoped that one of the batteries themselves may attend this practice camp soon.

From the foregoing it will be seen that these batteries, so far as

their equipment and opportunities go, now leave little to be desired. The other side of the question, however, must not be overlooked, viz., the difficulty, almost impossibility of getting natives to maintain that constant care and attention to routine, without which a battery cannot be efficient. There is little tradition of discipline in a native State army, no public opinion to condemn a slack officer, very little local opinion to praise a smart one, or admire a smart corps. Hence these products of civilization had all to be engrafted on not very promising material. It is now only some 5 years since No. 2 battery was organized for Imperial Service and only 3 years since No. 1 was so remodelled as to be practically re-raised. It was not possible, as when new corps are usually formed, to draw a nucleus of officers and non-commissioned officers from some old corps. Hence officers, non - commissioned officers, men and mules practically joined together and had to be trained at one and the same time, the native officers receiving a short training with a Mountain battery of the P.F.F.

It is not surprising, therefore, that at first mules and material suffered considerably from neglect born of ignorance, but the batteries have now made considerable progress and turn out and march very creditably, while the officers have taken an interest in their work and have acquired a sense of responsibility that was hardly hoped for amid the difficulties and anomalies that presented themselves when the corps were formed. Considering how little inducement there is for the officers to be really proficient, the work they do is most creditable, for they have small prospect of real advancement and need do little more than will save them from the inspecting officer advising their removal.

When any work is to be done, they respond readily, whether it be an arduous march as in the advance to Chitral, or to turn out smartly for a day in the hills or an inspection. It is in the every day routine of stables and care of animals and equipment that any difficulty is found in keeping them up to their work.

The inculcation of a spirit of discipline in an army which in previous years has always deserted with impunity when displeased with its officers, has been no small difficulty, though the want of it has been minimised by the amenable nature of Dogras generally. The Kashmir authorities have not yet seen their way to give good conduct pay and the absence of this decreases the effects of the ordinary summary punishments of the commandants, since there is no good conduct pay to be forfeited.

The administration of the Kashmir army is in the hands of the commander-in-chief (hon.) Lieut.-Colonel (in the British Army) Rajah Sir Ram Singh, K.C.B., assisted by Colonel Neville Chamberlain of the Central India Horse, who was deputed by Government to advise the durbar on its military affairs and help carry out the reduction of its overgrown and somewhat turbulent army and reorganize it on its present lines; a work of no small difficulty, enhanced by the maintenance of a considerable force at Gilgit and the question of its supply. Under the commander-in-chief is an adjutant-general and quarter-master-general and the usual staff at head-quarters, all native officers of the Kashmir army. There are also pay and medical departments

and the Imperial Service army consists of two brigades, each commanded by a general and staff. One general commands at Gilgit, the other at Jammu. The head-quarter staff, of course, carries on the administration of the regular and Imperial Service armies.

The corps stationed at Jammu are, save when occasionally required for State ceremonials and the small proportion needed for guards and escorts, placed at the disposal of the inspecting officers for drill and instruction, the usual course being that the commandants of corps carry out their daily parades according to a programme approved by the inspecting officers, who superintend generally and from time to time carry out formal inspections.

The Kashmir troops, of whom half are practically always on field service on the frontier and on whose efficiency consequently much depends, have resident inspecting officers at Jammu, with the exception of the cavalry which, like the troops of other States in India, form part of a circle presided over by an inspecting officer, whose visits are only periodical.

The army is recruited to a great extent from Dogras who inhabit the hilly territory on the Punjab frontier, between the plains and Kashmir, a race who have always made good soldiers. There is probably not a single Kashmiri in the whole Kashmir army, but some Sikhs and Pathans from settlements of those races in Kashmir, a relic of the Afghan and Sikh occupation of that country, are enlisted in small numbers.

The Imperial Service infantry regiments nearly all contain one of more companies of Gurkhas, a custom of old standing. At one time Gurkhas received a higher rate of pay and large numbers were enlisted and even now there is one complete Gurkha battalion in the Kashmir army. Some difficulty is experienced in obtaining Dogras of sufficient physique for the Mountain Artillery service, as none of them run very tall; they are, however, very sturdy men as a rule and a havildar of No. 1 battery, a No. 1 of one of the sub-divisions, carried the gun, weighing 200 lbs., over the top of the Shandour pass, a very considerable distance in several feet of snow. For his subsequent conduct at Chaklewat and Nisagul he received the order of merit, 3rd class.

The troops at Gilgit are superintended and led on service by British officers attached to the British agent's staff and are administered through the Dogra general there and the Kashmir army authorities.

They saw service under Colonel Durand in the Hunza campaign in company with British Indian troops; later, when Chilas was attacked by Kohistanis, their conduct was most excellent and when both British officers were *hors-de-combat* native officer after native officer took the place at their head, only to be shot down 'ere the enemy were beaten off. Last year again they took part with Indian troops in the defence of Chitral and the relief from the Gilgit side, and General Baj Singh, the Dogra general, commanding the Durbar troops in the Gilgit agency, together with the assistant commandant of the 4th Kashmir rifles, were killed one on each side of a British officer in the engagement outside Chitral with Sher Afzul's men.

The Hunza campaign was the first in which the Imperial Service

troops have been engaged, though a considerable contingent from Jammu took part in the siege of Delhi and on more than one occasion Kashmir troops have assisted in operations against the Black Mountain tribes.

With the exception of the Jeypore and Gwalior transport trains with Sir Robert Low's force last year, the Kashmir troops alone of the Imperial Service force have seen service, while the short period that they have been subject to systematic training hardly justifies their present value being accepted as representing the limit of fighting value to which the Imperial Service troops can be raised.

The Kashmir Mountain batteries have several advantages which the rest of the force has not, for not only have they the almost undivided attention of a British officer each, while other corps get far less supervision, but Government issues a complete equipment free of charge and replaces free all losses due to service in the Gilgit district. This concession not enjoyed by other corps allows of the equipment being kept more efficient than if the replacements of expensive stores, often suddenly required, was dependant on the provisions of the *Kashmir Military Budget* and has only been made recently, in view of the great expense to the durbar incurred in maintaining two Mountain batteries, even without charges for renewing equipment. In the case of other Imperial Service corps, the durbars pay for most of the equipment issued them, save arms and for all renewals.

The free issue of equipment to the batteries is also a recognition of the value of their services which obviate the presence of any artillery from the army of India in the Gilgit command.

There is, of course, much room for improvement in these Mountain batteries, but their present progress has been very steady and there is no reason why it should not continue as the spirit of discipline and soldierly bearing developes. They cannot, of course, be expected to attain anything like the efficiency of our native Mountain batteries, but it is as yet hard to say how far short the limit will be. They are certainly useful auxiliaries and should be fully equal to hill warfare against uncivilized enemies and a valuable supplement to the force of native Mountain batteries on the frontier.

It is needless to say that such measure of efficiency as has been attained by the Kashmir artillery, would never have been reached without the cordial co-operation and acquiescence of the commander-in-chief of the Kashmir army and his present head-quarter staff in the suggestions and plans put forward by the inspecting officers for its efficiency.

NOTES ON AUSTRIAN ARTILLERY.

BY

LIEUT.-COLONEL DE C. DANIELL, R.A.

Being at Görz last summer I was able, thanks to the courtesy of the Commandant of the Artillery, to visit the barracks. I found the officers most willing to show me over every part, and to afford me any information I wanted.

The artillery of the garrison consists of three field batteries, under a Lieut.-Colonel. In peace time only four guns and a small number of wagons are horsed per battery—the number of horses in each being 44. The remaining guns and all the ammunition are stored in the citadel, whilst the spare carriages are kept in a large gun-shed. These are stacked in two tiers, the upper one resting on planks laid along the wheels of the lower, thus greatly economising space. In the story above is kept the spare harness, amounting to several hundred sets, each hung on one peg, except the collars which are stocked according to sizes. On mobilization the horses would be paraded below in batches, the harness thrown out of the large loft door, and the fitting would be carried out in a very short time.

The stables, one per battery, are long, well ventilated buildings with a height at centre of arched roof of 18 feet. The windows with outside wooden shutters to exclude heat and glare. Down the centre is a passage 9 feet wide, slightly raised in the middle with a shallow drain on each side. The stalls are 10 feet long by 5½ wide, containing only a corn manger—the hay being placed on the ground; a far better plan than putting it up in racks. Both bails and posts are well protected by straw bands for about 3 feet.

The bedding is first formed by selecting trusses of strong straw 5 feet long—these are laid flush with the side drains, tightly packed down to a thickness of about a foot, and secured by a light batten across. On this permanent part, and on the stall beyond, some loose straw is scattered at night and removed in the morning. The permanent bedding is allowed to remain 3 or 4 months, except in cases of any horse contracting an infectious disease. When I visited the stables the bedding had only been laid for a few days—the stables smelt particularly sweet and were scrupulously clean, and I was told that even after it had been down for months there was no offensive smell. A great deal is due to the care taken—an orderly being told off night and day to catch the urine in a small bucket on the end of a 4-foot handle whenever the horses staled.

I have seen troop stables in America where the horses were stabled on wood floors, slightly sloped to the rear, without litter of any sort with most satisfactory results, as far as cleanliness.

The daily ration consists of—

Oats, ...	$3\frac{1}{2}$ kilos.	=	$7\frac{3}{4}$ lbs.
Straw,...	$1\frac{1}{2}$ „	=	$3\frac{1}{4}$ „
Hay, wheelers, ...	$4\frac{1}{2}$ „	=	10 „ nearly.
„ other horses, ..	$3\frac{1}{2}$ „	=	$7\frac{3}{4}$ „

In winter the wheelers and any other horses which carry heavy coats are clipped and blanketted up.

The harness struck one as being particularly light and simple, at the same time very serviceable.

The traces of flat leather, $1\frac{1}{2}$ inches wide with some 3 feet of twisted rope at the far end, are secured in front to a large staple on the hames by a triangular D, one side of which consists of a movable pin secured by a tie. To the rope end, in the case of leaders, is attached a rope trace, which, passing through a suspending loop on the centre horse's fittings, fastens to one of the pole swingle-trees—thus each horse has a direct pull on the carriage. The traces of the centre horses are similarly attached. The wither strap of the off horse is fastened to a leather strap $1\frac{1}{2}$ inches wide, which rests along the horse's back, sufficiently far to support the traces and hip straps—there being no crupper. Belly-bands are of leather. The harness of the wheelers is similar, except that there is in addition a light breeching, which is attached on each side to the trace, about half way up, and suspended from the back strap.

The pole strap is attached to a broad leather strap, which goes across the front of the collars, fastened at either end to the same D as the traces.

The pole is about 15 feet long—the method of coupling throughout consists of a ring on one part and a pin on a chain on the other, the pin being put through the ring from above.

The riding horses have a bit rein and the off horses a bridoon leading rein and side rein. The stirrups have flat bars. A folded blanket is carried under the saddle, which is roomy and well padded, with a flap about 3 inches projecting round the soft seat. The cloak and mess-tin are carried in rear, and in front are 2 saddle-bags containing change of linen, stable head-collar and cleaning traps. The leather is blackened, also the hames—the remainder of the iron work, of which there is little, being kept bright.

The guns are of bronze, 9 centimetres (slightly over 3·5 inches). Three gunners ride on the limber, two on the axletree seats. The axletree and limber seats are well padded and have a broad supporting strap—that on the limber is a foot from the rear, along which runs a net some 18 inches high, between it and the strap the mens' great-coats are stowed, their kits being carried on the wagon. There is a tire brake worked by a wheel in front. The handspike is always carried shipped; the pin-tail being on a semicircular iron band projecting two feet behind the limber on which the back flap rests when

laid down. The shells are carried on wooden boxes which pull out. On the foot-board is a box for spare traces and similar stores.

Thirty-four rounds are carried per gun and 94 per wagon.

The gun and limber packed (with five men) weighs 1910 kilos. (39¼ cwt.), the wagon (with three) 2202 kilos. (45 cwt.), six horses to guns and wagons and a mounted N.-C.O. to each two guns.

The barrack-rooms are airy and very clean and tidy. The bedsteads consist of light iron frames and wood-bottom boards—good thick palliasses and white sheets and blankets.

Both gunners and drivers wear breeches and boots, the latter being very well made and light.

The mounted N.-C.O.'s have cavalry swords and revolvers, all others a short straight sword—a few rifles are carried for escort or guard duty.

The officers wear dark-brown cord breeches, black boots, a plain blue tunic not unlike our own—the only ornamentation being red cuffs, a red patch on either side of the collar on which are the badges of rank, viz.: one, two or three small gold stars, a thin gold shoulder cord on the left side only, gold laced belts and slings and a peaked cap laced according to rank. The general effect is very neat and smart, and far more inexpensive than with us—a tunic only costing £3!

The horses, as a rule, were lower and lighter than our own, but showed little signs of the hard work they had lately done, for the batteries had just returned from two months' manœuvres over a very rough country during the hottest time in the year, still there were no signs of galls of any sort; this is probably due to a certain extent to the excellent system of harnessing which, by-the-bye, has been selected by the Shah of Persia as a pattern for his own—that it is very light and still most durable there seems to be no doubt, and it is naturally well fitted for hot climates.

The men were sturdy and well built and seemed cheerful and willing—drawn as they are from various districts, often speaking only their own dialects (six or seven in a battery), the officers have to do a great deal through the better educated N.-C.O.'s.

Service in the artillery is very popular and both officers and men are proud of the arm to which they belong.

The officers are good riders and good whips—both of which accomplishments they acquire under most favourable conditions on first joining, as horses, hounds and brakes are kept up for this purpose by Government at the school of instruction for the mounted branches.

THE COAST DEFENCES OF NORTHERN TUNIS.

BY

MAJOR H. C. C. D. SIMPSON, R.A.

A visit to Northern Tunis in December last enabled me to obtain some interesting information on the coast defences of the towns of Tunis and Bizerta, the two principal military and naval ports of Northern Tunis.

The coast defences of Northern Tunis comprise, firstly, the forts and mobile naval defence guarding the approaches to the Tunis Canal; and, secondly, those defending the entrance to the Bizerta Canal.

Both these canals themselves have been so fully described in various periodicals that it is unnecessary to go into any detail concerning them here. In connection with the Bizerta Canal, the following points may be noted:—

It was constructed by a French company, who, in return for the fishing in the lakes, valued at £4,000 per annum and a certain percentage of the canal dues, guaranteed construction and "up-keep" of the same. The port has, however, been open for some time, but has proved up to the present a commercial failure.

The amount of coal which the French authorities have deemed necessary to be stored at Bizerta is fixed at 2000 tons, of which the supply is mainly British. Owing to the silting up of the sand during the prevalence of the N.W. winds, and to give greater protection in that weather to ships anchored inside the breakwater, it has been found necessary, even bearing in mind the increased difficulty of entering the outer harbour in bad weather, to incline inwards the northern arm of the breakwater (*see* sketch *d*) for some 150 metres of its length from the head. This work has not been carried out yet.

The passage of the canal during a N.W. fresh wind would, it is feared, be of some risk to a ship of war of any size, whether entering or leaving the canal, owing to the strong current running through it. The inner harbour would thus act as an excellent trap, and no better luck could happen to a hostile fleet than for the French squadron to enter the Bizerta harbours under the above-mentioned conditions in war. The coast line is sandy, but it would be impossible to land a hostile body of troops, except in surf boats, in any weather but the calmest.

Tunis Town.—The defences of Tunis town as well as Bizerta are planned only with the intention of resisting raid or insult, and not with

any view to the bombardment of a hostile fleet. The batteries themselves in both places are open and constructed on much the same lines as those indicated in certain plates of Lewis' "Confidential permanent fortification for officers R.E.," the outside measurements varying from 150 metres to 200 metres in length. The fort defending the entrance to the Tunis Canal is situated on the coast line close to old Carthage. Its title is Fort Bordj-Djedid (*see* maps *a* and *c*) and it is situated on the western shore of the Gulf of Tunis, about $1\frac{1}{2}$ miles north of La Goulette, the entrance to the canal. It is, I should estimate, about 80 feet above the level of the sea. Its armament at present consists of two groups each of 2-22 cm B.L. guns the arcs of fire of which cover the whole sea front of the canal. The guns are mounted "en barbette" and approximate in shell power to our 9·2″ B.L. guns on similar mountings. Between these two groups, when I was there, was being prepared an emplacement for a heavy gun on disappearing mountings. I gathered the gun had not yet arrived in Tunis. The magazine is in rear of the centre of the battery and well sunk. The fort is thrown back about 60 yards from the sea line (tide about one foot full) and I should say there was a large sea area of dead water under the fire of the guns. The arrangements for fighting the forts must be of a simple primitive nature, and are marked by a complete absence of any telephonic or telegraphic communications, or electric light instalment. By means of one military wire, it is in telegraphic communication with the military district head-quarters at Tunis, from which it is distant about 25 kilometres, or $\frac{1}{2}$ hour by rail, Tunis to Malka, (*see* map *a*) and thence to the fort about 20 minutes walk.

The water supply is ample and good from the old Roman cisterns of Carthage, recently renovated at some expense, and situated just outside of and to the S.E. rear of the fort. There is plenty of encamping ground in the neighbourhood of this water supply for the whole Tunis brigade, which consists of four battalions of infantry, one regiment chasseurs d'Afrique and a sufficient proportion of artillery.

The actual garrison of the fort in peace is merely a few zouaves and gunners to keep the fort and its armament in working order.

To attempt a landing on the rocky foreshore would, at any time, be a hazardous operation, unless it were made on the northern side of the fort, and the commanding position of Sidi-Bou-Said (*see* map *a*) occupied, when from the rear the fort could be made untenable. The floating defence consists normally of one torpedo gun-vessel and two 2nd class torpedo-boats. There are no submarine mining arrangements.

Bizerta Port Defences.—Owing at first to want of money and to some settled plan as to extent of fortification necessary, the coast defences of Bizerta have only just been completed and are not likely to be increased for some time to come. Indeed, the only military work on which the authorities are engaged, at present, is on the construction of the arsenal at Oued Tindja, on the further side of the inner lake (*see a* sketch *d*).

The most important battery of the Bizerta defences is Fort "Djebel Roumadia" or "Ben Nigro" (*see b* sketch *d*) on the S.E. side. The

armament of the left wing of this fort consists of 4·22 cm B.L. guns, mounted "en barbette," and of the right wing of 4·47 cm Q.F. guns (provided with shields) on cone mountings. The height of this battery must be nearly 200 feet above the sea and it is most admirably situated on a line of hills about 1000 yards from the sea level. The battery is built on land, the property of the British Consul and adjoins his property, which commands the fort from the rear. It is well concealed from the sea front, a position about 1000 yards to the east of it being often mistaken by ships out at sea, as the real site of the fort, owing to a curious configuration of the hills at this point.

On the northern side of the canal is the important battery of Fort d' Espagne (*see c* sketch *d*) adjoining the old Spanish forts of the same name erected at the northern angle of the walls of the old Arab town of Bizerta, and now forming a barrack for the artillery garrison of one Field battery and a few fortress gunners.

This battery is situated about 500 yards from and rather under 150 feet above the sea, and well concealed, an old quarry on some neighbouring heights often being mistaken for it from the sea. Mounted on its left wings are 4-22 cm B.L. guns "en barbette." Its right wing is constructed to serve as either an infantry parapet or for the mountings of light Q.F. guns not yet arrived. On the south side of this fort is an earthwork of field profile, in which are mounted four field M.L. guns on travelling carriages, the equivalent about of our 9-pr. R.M.L., 8-cwt. guns. These guns command the Arab town, and the banks of the canal at a range of about 900 metres and ½ mile from railway station.

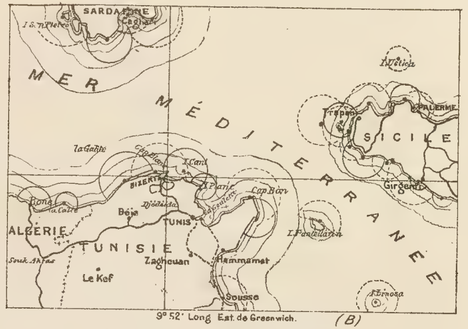
The garrison of Bizerta constitutes a portion of the Tunis brigade, and consists of ½ battalion zouaves in a cantonment west of the Arab town, the detachment of artillery referred to and a few sappers.

There is no permanent floating defence. The French officers stated that Bizerta is merely held strategically as a checkmate to the corresponding naval fortress of the Italians' Maddalena in Sardinia (*see* map *b*). There appears to be no special provision for combined action between the forts in an engagement but their handy heavy groups of guns of one calibre and consequently one nature of ammunition, compared to our complicated system of scattered groups of different calibres, intricate plans of communications, etc., inspired me, I must confess, with a feeling of envy. Bizerta is 60 miles by road, or three hours rail from Tunis, with which it is in telegraphic communication. Supplies in the neighbourhood are plentiful, but beyond water fowl the sportsman will not meet with much reward for his exertions. In the mobile land defence of their coast towns the French employ a proportion of Mountain Artillery, which seemed efficient and organised more like our Indian batteries than the batteries employed by them in the Alps. When shall we increase our small force of Mountain Artillery at home for expeditionary purposes, if by one battery or train section of our Garrison Artillery as a reserve for this service?

(C)

TO ILLUSTRATE TUNIS DEFENCES.

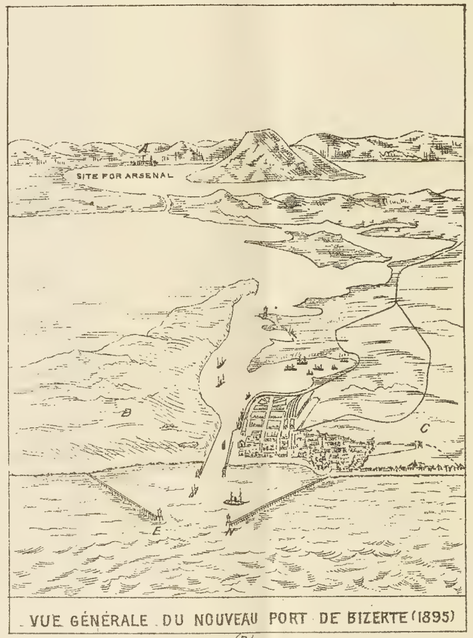
TO ILLUSTRATE BIZERTA DEFENCES.



(B)

TO ILLUSTRATE TUNIS DEFENCES

(A)



VUE GÉNÉRALE DU NOUVEAU PORT DE BIZERTE (1895)

(D)

TO ILLUSTRATE BIZERTA DEFENCES.

MAPS & PLANS IN ILLUSTRATION OF FORTIFICATIONS OF NORTHERN COAST OF TUNIS.

LETTERS

WRITTEN BY

LIEUT.-GENERAL THOMAS DYNELEY, C.B., R.A.

WHILE ON ACTIVE SERVICE

BETWEEN THE YEARS 1806 AND 1815,

ARRANGED BY

COLONEL F. A. WHINYATES, *late* R.H.A.

(Continued from p. 470, No. 10, Vol. XXIII.).

Letters XV., XVI. and XVII. give the advance from Madrid for the siege of Burgos, the retreat of the army to Salamanca and final return to Portugal.

LETTER XV.

(To His Sister Dora).

Camp near Villa Toro, *September 21st, 1812.*

You may suppose, my dear Dora, I am a little anxious to hear that you have heard of my return to the British army. I can safely say that, with the exception of a wish I have to see my family and some other friends, I have not at present even an inclination to change for Old England. I certainly had reason to expect an illness on my return after the fatigue and anxiety I had undergone, but, thank God, I have never enjoyed better health. The cold weather has set in and I shall now do very well. We have had a vast deal of rain lately, but I manage to keep it out remarkably well by a tolerable proportion of blankets and Mrs. Lyon's umbrella fastened to the head of my bed. I do not expect we shall have much wet this winter. We reached this ground yesterday and have only had one day's halt since we left Madrid. I feel the most for the poor horses, after a hard day's work they are obliged to remain in the open air exposed to the cold rains. By-the-by, when I say that, I forget our men whose case is still harder; they are obliged to remain out and many of them have not a blanket or great coat to cover themselves with.

His Lordship is again employed besieging; we invested this place, Burgos, on the 19th, and in the evening stormed the outworks. Our loss was great, but not so heavy as might have been expected from the fire the enemy kept up. I lost one very old friend, Major Pierrepoint.

Baynes will recollect him, he was in the Quarter-Master-General's department in Sicily, he made the drawing of the battle of Maida, and has finished a capital one of the battle of Salamanca. You will all be very sorry to hear of the death of poor General Wheatley. It was very sudden; I was on the road to the Escorial with the intention of going to breakfast with him, when I was met by an officer who told me he was dead; his loss is universally regretted, every officer who knew him speaks of him in the highest terms.

As I am writing I have a most beautiful view of the besieged castle; we are now lying about a mile from it, but they are too busily employed with the people in the trenches to think it worth while to give us a shell. My friend Burgoyne got a lick on the head with a splinter yesterday morning; I have seen him since and he has returned to his duty. The duties in the batteries are to be taken in three reliefs, two of which are to be furnished by the reserve and the other by the brigades alternately. Major Carncross[1] is to be the superintending field officer, so that they do not intend the Royal Horse Artillery should share the honour.

The remains of Marmont's army made a stand once or twice on their march from Valladolid, but when we advanced in order of battle they retired. Downman asked me to do aide-de-camp for him. As our troop was not in front I was happy to consent, and I had an opportunity of being up with our advanced vedettes and seeing all the fun.

I have this moment had my mother's and Jane's letters of the 1st September put into my hands. Thank them most kindly and tell my mother I shall manage very well to keep myself warm until the flannels arrive.

I suppose part of the army will be left here to look after the enemy, who are now about three leagues in our front, and the remainder march in the direction of Madrid to meet Marshal Soult. If he comes he will be strong, and I think we had better mind we do not burn our fingers after all our success. As for myself, I have never had much confidence in either the Spanish or Portuguese troops; their officers have no heart for the cause. At the battle of Salamanca I caught one officer, with his sword drawn, running away. I stopped him short and made all the men at the guns hiss and abuse him, then gave him over to the 40th regiment, who hooted him from right to left; but the fellow did not care, he saved his head which was his object. As for the famous Galician army, I have seen it, and in point of appearance it would be a disgrace to the English hulks. In fact, I must not say more on this subject, only mark my words, if ever we trust in either army our game is up.

[1] Kane's List, No. 727.

LETTER XVI.

(To His Sister Dora).

San Payo, *November 23rd, 1812.*

Here we are all back again and I am happy to say I was never in better health and spirits in my life.

To give you an idea of the miseries of our retreat would be impossible unless I had you here to talk it over. Suffice it to say that certainly nothing could have been worse conducted. We commenced our march on the 14th November and it never ceased raining until our arrival at Alamedilla on the 21st, therefore you may suppose the state the country was in for the poor men and horses. I am unacquainted with the number of each which we have lost, but it must be prodigiously great. You may easily imagine this when I tell you that the enemy were pushing us hard the whole way and that I saw some hundreds of men, women and children stuck in the mud, and unable to move from hunger and sickness. In a great many instances our poor wounded men had only the alternative either of being left behind and falling into the hands of the enemy, or of being dragged along by two men of their regiment. You may judge of my feelings on being obliged to refuse application after application to carry these unfortunate beings on our gun-carriages. Many of them, to excite compassion, would pull their clothes aside to shew their wounds, but we were obliged to turn a deaf ear to them or risk the loss of our guns by overloading the horses. I leave you to decide how great the danger of doing so was when I tell you that the horses were fed on the evening of the 16th, and after that, I declare upon my word, that the poor devils never had a single thing of any sort within their lips until the evening of the 20th, save and except the harness they eat off each other's backs, and the lids off the limber-boxes! One, indeed, I had compassion on and gave him a double handful of sand-stone, which I assure you (you need not laugh for it is a fact) he eat as eagerly as I ever saw an animal eat beans.[1] You will be surprised no doubt to hear that in these four days we only lost four horses and two mules, which were the worst in the troop.

On the 17th, between one and two o'clock, we came into action[2] and the second or third round of the enemy's fire disabled Macdonald. Of this I knew nothing until a few minutes afterwards when, enquiring for him, I was told he had been carried very severely wounded to the rear. In the course of half-an-hour a man returned bringing with him the piece of shell about an inch and a half square, just as it was cut out of the wound, and begged to know if I wished to have it, which I declined, thinking it was more than probable I should have a bit to take care of for myself before the day was over. For we remained on the same spot from that time till dark with five guns playing from a hill on our right flank and four in our front ploughing the ground up in beautiful

[1] *See* Swabey Diary entry for November 21st, 1812.

[2] At San Muños at the ford on the Yeltes river.

style, the troop standing counting the shots on their fingers. As we had received orders from his Lordship not to fire at artillery, or anything but formed columns, which latter did not trouble us much, we only expended 140 rounds the whole day and our loss was very trifling, only four men wounded. The poor infantry, who were immediately in front and directly behind us, suffered dreadfully. When our men were not actually firing, I made them get behind some trees near us. How I stood it all I know not, for the whole time I was nearly over my shoes in water, and every day on horseback from two, three, or four o'clock in the morning until an hour or two after dark at night. However, Swabey and I lived together in the same tent and managed to get on tolerably well. We got one good meal every day, and nothing could be more fortunate than the arrival of my mother's box of biscuits. I received it the very night we commenced our retreat, and as for the snuff,[1] oh, ye gods! I literally had taken the last pinch I had not ten minutes before I opened the box containing that article. Thanks for the snuff-box, hair-brushes, etc., etc. Captain Parker brought them up for me, he arrived just in time to return with us. This campaign has sickened a great many, but, as for myself, I sit swinging my legs in my arm-chair with my pint of mulled wine before me singing "Adieu to the white cliffs of Britain." I believe I may say I am as happy as any man in the army. I am pleased to have the temporary command of the troop, but then I have my little grievance which is having all the trouble and anxiety to get it into thorough repair during the winter, and then in the spring another man will pop up his head and take it from me to fight with.

I am very sorry for Macdonald, and pity his sufferings from so severe a wound and the distress it will cause his family. I have just heard from him and he complains sadly of being in a great deal of pain during the night; it is, I understand, a dreadful wound, and from its being so high up it will be impossible to amputate should it be requisite.

Fancy the luxury of our poor nags in coming off such a march and getting into stables with straw to lie upon, and plenty of hay and corn! I am in hopes we may be able to save them yet, but have just heard that we are to have another week's march to the rear, which will prevent our carrying anything but the boxes of the horses into quarters.

I see by all your letters up to the third November that the papers were pretty correct in their accounts of the Shaston election. I wish I had had M——— on the retreat with us, he would most certainly have been one of the number left in the mud.

The army is most dreadfully sickly. No wonder, poor devils, when they were for a week or 10 days marching up to their knees, and many times up to their elbows, in water. We have 25 now sick with the troop, besides double that number in the rear, amongst them Mr. Reed, whom I have not heard of for the last month, but I am sure

[1] Captain Dyneley was a great snuff-taker, and it is said he used to put a box at each end of his pillow at night, so never to be at a loss for a pinch.—Ed.

he is well taken care of, as I sent him to the rear with a friend of mine in the commissariat department. Dinner is just ready—"For what I am going to receive the Lord's name be praised." I must have done for the day and, as I daresay you will all drink my good health, I shall return the compliment in a bumper. Tell my mother she need not now say how old I am. If asked by "Eighteen," I am 25, if by "Twenty-three," I am 30.

December 3rd.—The report of our marching was pretty correct, for we were off the next morning at daylight and reached our present quarters late last night (the 2nd), where I am told we are to be cantoned for the winter. The name of the place is San Payo, I am in the priest's house, the best in the town, and have every comfort I could wish, but I am sorry to say the town contains so little hay that I shall be obliged to apply to remove to another village more in the vicinity of that commodity.

It is so long since I had an opportunity of writing that I am afraid you will begin to think I am "off the hooks," but it has been completely out of my power even to send you a few lines had I had an opportunity of writing.

I really think, if possible, it has been harder work for the horses this last week than the former part of the retreat. The hills are so dreadfully steep in this part of Portugal. In the same day's march we have been obliged to put on four extra horses to get the guns uphill, and then unlimber and run them down by hand, it being impossible from the steepness to make use of the horses.

I have this moment had a visit from a friend of mine, Mr. Gregory of the 4th Dragoons, on his road to England. I have given in his charge a shawl and a pair of shoes. As I have at last got a conveyance for one set and thus broken the ice, I may as well tell you that they are a sample of 10 of the former and 14 of the latter that I bought at Madrid, and have been carrying about the country ever since, not having been able to meet with a conveyance, but I thought it better not to tell you as it would only set you on the fidget until their arrival. When they are all safely landed in Bloomsbury Square, my mother will, of course, have the first choice, then I request she will let Miss Scott fix on a set for herself. I would send them to her myself, but I suppose that old-fashioned fellow "Etiquette" points out the other channel as the more proper. However, I have another sample of acorns (evergreens) which I picked as I rode along on "the retreat" which I shall send by the first safe conveyance.

Colonel Gordon, aide-de-camp, has been gone these four or five days to Salamanca, about the exchange of prisoners it is said. I know nothing more of it than I can collect from persons passing through. I expect an order to move from this place very shortly, as I have written to complain of the want of forage. I cannot write any more. I do assure you I have plenty to do, I will write when I can, but I know not when you will get this, but I suppose about Christmas day. Drink Mrs. Close's health in a bumper.

San Payo, *December 5th.*

P.S.—I am happy to hear there is again a talk of another battalion; tell Baynes to let me have the names of his children, as I shall be in want of an aide-de-camp by the time I am a Major-General, or perhaps quite as likely two old women to nurse me. A Merry Christmas to you all.

LETTER XVII.

(To His Sister Jane).

San Payo, *December 20th, 1812.*

Many thanks, my dear Jane, for your letters of November 25th and December 2nd, the latter of which I received on Sunday last. I have seen papers of December 4th, by which I find you have got his Lordship's despatch from Ciudad Rodrigo of November 19th, and nicely he has run it over to be sure. Well, he is a lucky fellow to be able to gull John Bull so easily, and I cannot help wishing his noble brother had sent me his speech to read before he went down to the House, I should have made many alterations. I most certainly should not have allowed him to have said, "it is to his retreat that I would go for the proudest and most undoubted evidence of his ability," and then again, "I confess before heaven, I would not select his victories, brilliant as they were, I would go down to the moments when difficulties pressed and crowded upon him," etc., etc. Poor man, he does not seem to know much about the business, or rather, I suppose, did not choose to know. I will just give you a little order from the book which we received from the Earl of Dalhousie a few days after our return. "The Lieut.-General at present warns the officers that it is no usual observance of discipline or common attention that will effectually re-establish the disorganized state of every battalion without exception." Now I should have read this to the noble Marquis and at the same time have told him that I did not suppose in the memory of man a more disorganized, plundering rabble were ever got together, than those that were marched into Portugal on or about the 19th November, 1812. Stop a little until you have seen Soult's despatches, he will tell you more about it; he will tell you what he obliged us to destroy[1] and what he took from us. You ask me why his Lordship wrote so dolorous a despatch. Because, I suppose, it was evident to him and to every drummer in the army that we were in a most perilous situation, and he wished to prepare your minds for the worst.

You say I speak but slightly of Reed's loss, I can account for that too; for at the time I was writing to you I had just come out of his room, having said to him, "then I'll be d——d if you may not go to the rear and stop there for what I care!" He had been very unwell for several days with ague and fever, and then off he set with the

[1] Apropos to this remark, the following will throw some light. Writing from Dublin, March 16th, 1854, to Brigadier-General Cator, R.A., with regard to the supply and conveyance of small-arm ammunition for the campaign of 1854 and 1855, Mr. J. Butcher, Commissary of Ordnance, says, "When the army moved from Burgos to the frontiers of Portugal it became important to take immediate and active steps for the removal of the depôt of ammunition at Valladolid to Salamanca, and I was charged with that duty, as well as afterwards for the further removal of the depôt at Salamanca, increased as it was by the quantity removed from Valladolid. At one time it was expected that a battle would then have been fought at Salamanca on the old ground, by which a great portion of the reserve ammunition then collected there would have been required to replace what would have been expended. The army, however, suddenly commenced its movement to Ciudad Rodrigo. The enemy was pressing the rear of our army and had crossed the river within 500 yards of my party, my means for getting away the ammunition had been used until it was exhausted, and I was left to use my own discretion for disposing of what remained, about 300,000 rounds of ball cartridges, and I blew it up to prevent its being taken possession of by the enemy."—From *MS.* in possession of General Sir John Adye, G.C.B., R.A.

young hounds and walked four or five hours up to his knees in water, and the next day complained of having no use in his limbs, with terrible sweats in the night. Nothing could have saved him but the extraordinary care paid him by a Commissariat friend of mine. He has returned and is looking as well as I ever remember to have seen him. Do you remember his going with Miss Scott's news of General Graham's victory and the fool's running all the way back and Mr. Ratcliff's[1] riding my black pony almost to death to carry the express to Woolwich? Of this last gentleman I will give you a short account. He was not appointed valet as you suppose and I will tell you why. On the first part of our retreat I lamed my little horse "Bobby" very badly and told him to go with the spare ammunition carriages and lead the horse in his hand. In one of the towns they went through the inhabitants had all fled and left their houses, cellars, etc. all open. Here Mr. Ratcliff thought proper to stop with some hundred of others until he was so drunk he was unable to stand; but a cry that the enemy were coming into the town roused him and he mounted his charger, rode directly across the country over everything and joined the troop just as we had got to the ground where we were to encamp for the night. As ill luck would have it for him, I was just looking out of my tent and caught the gentleman riding up. I was not long having him off his perch, which I accomplished by catching hold of one of his legs and hurling him to the ground. I instantly sent him to his duty with orders that he should walk every step of "the retreat," which he did, and I believe he now begins to feel that he was quite as comfortable in his old situation. I have not yet taken him back, but I shall see about it some of these days.

How nicely you forgot to enclose me the letter you talked of from Miss Baker. I am sorry to say we have no accounts of young Baker's return to the army. I never gave you hopes of his being able to effect his escape; the only hope I had was of an exchange being made, as I was at the out-post when the French General's letter came in, offering to exchange any or all the prisoners they had, but this I believe his Lordship sets his face against, for what reason I know not. However, his family have the consolation of knowing that he is as well off as a man under the circumstances can be. He has the whole of his baggage with him, his horse to ride, and plenty of society in the Colonel of his regiment and many others whom we lost about that time.[2] My lot was very different, I had nothing, and nobody would give me anything, and no other society for the greater part of the time than the Major of artillery's German boy who rode on the baggage waggon with me.

My friend José was certainly up on the 17th November, the day on which Macdonald was wounded, and no doubt it was some of my old friends who helped to oppose us.

So poor William Lyon is coming out. Well, he certainly comes out at the best time of year to season him for the campaign. I do not

[1] His groom, Gunner Richard Ratcliff.

[2] Lieut.-Colonel R. Pelly and Cornet J. R. Baker, 16th Light Dragoons, were taken prisoners during "the retreat."

know what to think of the chance he has; his duty will be very severe. We have had a most dreadful time of it this last fortnight. I do really believe it has never ceased raining for half-an-hour, and our poor men have never had a dry stitch on their backs during the whole of that time. I wish I could meet with a conveyance for the acorns for Miss Scott; I had them out for inspection this morning and gave them a polishing to prevent them getting mildewed. Make my kind remembrances to her when next you see her.

I heard from Harding yesterday; he has sent me a fine turkey for my Christmas dinner; he is in sad distress about a young brother who has very lately come to this country. He had heard of battles and must come here too, and pretty work he has had of it! In coming up country he had all his baggage stolen, and Harding found him at Salamanca without an article. I lent him £40 to set himself up again, and he had the whole of the new kit taken by the enemy, in addition to which he is very ill, but in what part of the country Harding cannot learn. The moment I saw him I was quite certain in my own mind that he was not one to stand the fatigues of the campaign, and if he does not return home shortly, he will not get home at all. Tell Barbara I did not forget her orders about young Ord. I met him on the retreat and, like most of his neighbours, without a farthing in his pocket. I therefore lent him £20, so you see I am "Gosling" to the army.

Extraordinarily enough, just as I had finished this last sentence, in walk Downman and Harding come to stay three or four days with me. Harding has not heard from his brother[1] since he wrote.

San Payo, *December 22nd, 1812.*

It is to be regretted no other letters from the Peninsula are forthcoming. We lose therefore Captain Dyneley's experiences of the campaign of 1813, including the affairs at Morales de Toro, that of June the 12th, and of the battles of Vitoria and the Pyrenees.

He would have entered his name as a volunteer for the siege of St. Sebastian, but for a letter received just before from his mother entreating him not to expose himself unnecessarily; nevertheless, as an amateur, he was pretty constantly in the trenches.

In November he experienced a severe return of the disorder which obliged him to quit Sicily and was sent to England by a medical board. He was on the eve of rejoining the army, his horses and baggage being embarked, when news arrived of the termination of hostilities in April 1814.—Ed.

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[1] This brother was in the 5th Regiment. He is mentioned as being with the army in December 1813, by Lieutenant Richard Hardinge, R.A., in his diary.—Ed.

Letter XVIII. brings us to the Netherlands in 1815, and describes the retreat from Quatre Bras and the battle of Waterloo.

LETTER XVIII.

(To Captain J. K. Douglas, R.A.).

Marissel, France, *August 25th, 1815.*

I daresay, my dear John, you have been looking out for a line from me, and very long since you should have received it had I had one moment to myself. Before the fight I had nothing to tell you but that I was shut up in a Dutch farm-yard where I had plenty of good eggs, bread and butter, etc., and immediately after the action I was ordered to take charge of poor Bean's troop, which I held until I gave it over to Captain Mercer on the 28th of last month, and again joined my own, Captain R. Gardiner's.

Now I must go back to the 16th of June. About three o'clock a.m. we were turned out by an order to march immediately and started about four o'clock and marched till eight o'clock that night, got something to eat and went to bed. At eleven came "the rouse" again and away we went and were headed short the next morning (17th), at daylight, by finding the enemy drawn up ready for us. About twelve noon, an order was given for the infantry, artillery, baggage, etc. to retire, and for the two hussar brigades, commanded by Generals Vivian and Grant, with Webber Smith's and Gardiner's troops, to remain and cover the whole. About four o'clock the enemy discovered what we were at and pushed on some tremendous heavy columns of cuirassiers and lancers with three or four brigades of guns. Vivian sent me in advance with a couple of guns and I blazed away at them furiously; the practice was good, but they dashed on with as much unconcern as if I had only been pointing my finger at them. Vivian then told me to get away as fast as I could and join the other four guns, when we received an order to make the best of our way to the rear, and off we set at a gallop, and at that pace, with whip and spur, we were obliged to keep it up for 10 miles, the rain coming down the whole time in bucketfuls, and the water up to the axle-trees in many parts of the road; to make my own situation more comfortable, my horse had cast a fore-shoe.

All this time the hussar brigades were not above 200 yards in our rear, and disputing every inch of ground. However, at last Jack Frenchman pulled up, from being blown I should suppose, for they were the same fellows who had surprised Blucher's camp a day or two before, and had come a very long distance to meet us. When they pulled up, of course we turned about and stared at them, but seeing they had done for the day we went a mile further to the rear and halted for the night. I certainly never was so hungry in my life, not having had a morsel within my mouth since the evening before. However, we broke open a house from whence the inhabitants had fled, and found some bread, butter and potatoes with which we

did exceedingly well. I think I could have astonished one of those cold legs of pork which I have so often left with unconcern at luncheon at Twyford.[1] The next morning (18th) we were turned out by Vivian and half a dozen galloping aides-de-camp after him, who came into our camp calling out: "Turn out artillery! turn out artillery!" We thought by the noise they made we should have the fellows upon us before we had time to hook in; however, we were not long in moving off, and had advanced about half a mile when we came upon the French army.

Little was done on either side till about twelve o'clock, when they brought their artillery forward, deployed into line, and opened about 40 pieces upon us at once. The rascals certainly did this beautifully, at the same time sending a very strong body of infantry, supported by their cuirassiers, on our centre. I went with a couple of guns and peppered away at them until the Life Guards charged, passed through them, out the other side upon the cuirassiers and broke them most completely. Had the Life Guards pulled up here and secured their prisoners, our loss would have been trifling, instead of which, without two men being together, they galloped on, every man his own commanding officer, until they came upon the second line of infantry, who were lying down behind a high bank in wait for them; they opened fire and scarce a man of ours returned. Many of the Greys had gone past the infantry without seeing them and were brought down in returning.

The enemy, finding they had failed in the centre, sent a prodigious mass of cavalry to force the great Brussels wood, but were repulsed as often as they charged. Some of our troops of Horse Artillery lost their guns two or three times in the course of the day, and suffered most dreadfully in men and horses. We were more fortunate on the whole, but at the time the Greys were charging, the enemy threw a shell directly into one of our limbers and blew it to atoms, killed the sergeant and wounded four men, these with about seven or eight men killed and wounded and a dozen or 15 horses, are all we lost, not an officer touched. The French behaved worse to our wounded than ever I remember them to have done. Poor Major Howard[2] of the 10th had been wounded in the face and was going to the rear when two infantrymen pulled him off his horse and beat his brains out with their muskets!

Well, but I forgot, I should have gone on with the fight. About five o'clock the Prussians came into action; we had seen the head of their column four hours before and were not a little anxious to see their first gun fire. They advanced with a very heavy body of cavalry in front, with which they charged the moment they came on the ground. This was a remarkably fine sight and our army gave them three cheers.

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[1] Twyford Abbey, Acton. The home of the Douglas family.—E[1].

[2] With regard to Major Howard's death, Siborne says that at the end of the day, Howard, with a party of the 10th Hussars, by order of General Vivian, charged an intact square of the Grenadiers of the Guard. The charge was unsuccessful though made home to the bayonets of the enemy. Howard was shot in the mouth and fell senseless to the ground, when one of the Imperial Guard stepped from the ranks and killed him with the butt-end of his musket.—*See* Siborne, Vol. II., p. 213, also Waterloo letters, p. 176.

The action continued desperate until about seven o'clock when the Duke sang out, "send on the cavalry, I'll attack them," and on they went in a most magnificent style carrying everything before them. The slaughter throughout the day had been dreadful and the ground was so completely covered with killed and wounded that it was with great difficulty we could pick our way so as to prevent driving over them, and I saw hundreds of poor fellows ridden over.[1] You have no doubt heard how near a thing it was; the scales were even for several hours, indeed I may say Napoleon's side came down, but by a happy hit we brought ours down and sent his high enough; if it had gone the other way, certainly not a gun and, I think, scarce a man would have escaped, and Napoleon, instead of being on his passage to St. Helena, might now have been at Berlin or any other place he thought proper. For whatever they may say of the Prussians, they certainly cannot do the trick, and if we had not been in the country, Napoleon would have beaten them and the Russians too out of it in no time, though you see a very different account in print. The French beat the Prussians in almost every action from the 18th to our entry into Paris, but then they brought up such immense reinforcements that the French, knowing our army was close in the rear, found it was impossible to take advantage of their victories.

I do not think Louis' crown is worth much; his only chance would have been if, instead of dividing the scoundrels of Generals, etc. into two classes, one to be brought before a court-martial, and the other to retire into the interior of France, he had only made the difference by hanging article No. 1 up by the heels, and No. 2 by the head.[2] Now he has left them at large to bring about just such another business as we have had lately. The whole of the soldiers, and I may say, with very few exceptions, the people are for Napoleon; they cannot understand his being sent to St. Helena; they ask if we did not want him to escape again why not kill him. Every peasant will tell you we shall never have peace as long as he is alive, and the apprehension of his return, and of being visited for their sins, prevents them from declaring openly their sentiment for the King. As for the soldiers, I think they are one and all for Napoleon.

I am sure you would rejoice when you found I had got the Majority. Vivian recommended me. I knew nothing about it

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[1] 'E' troop was attached to Vivian's cavalry brigade, which was on the extreme left of the line, and ordered not to be engaged, but kept entire until the arrival of the Prussians. However, the desire to assist Ponsonby's cavalry brigade when it charged the infantry of d'Erlon's corps in their attack on the allied left seemed irresistible, and Sir Robert Gardiner advanced two guns. For an excellent account of 'E' troop on the 17th and 18th of June, 1815, *see* Waterloo letters, p. 194, *et seq.*

It is probable that 'E' troop was the reserve to which the Duke of Wellington referred in his letter to Lord Mulgrave in December 1815 (*see* Duncan R.A. History, Vol. II., p. 447) and which did advance with great effect at the end of the battle, none of the other troops or brigades being then in a condition to do much in way of movement. The reserve division of artillery, 'A' and 'D' troops and a field brigade, were engaged early in and throughout the battle.—Ed.

[2] By an *ordonnance* of July 24th, 1815, amnesty was granted to all concerned with Bonaparte, except certain officers and officials, who were to be tried wherever found by Council of War. Certain others were to leave France within two months and not return without Royal permission. All the Bonaparte family were to leave France within a month and their property to be sold within six months.—Ed.

until three days before the list came out, when the General told Gardiner he had done so. You know, John, many a man has got a Lieut.-Colonelcy for writing a good despatch. I don't think I should be entitled to one for this; however, I don't care, I will send it, I know you won't pull it to pieces. I remember being laughed at at Twyford and told I had better remain a Captain, as being called a Major would make me look so very old; now I beg leave to state that it has had quite the contrary effect and that I look 20 years younger and am on uncommonly good terms with myself.

I wish when you see Close you would tell him I shall be very much obliged to him if he will try and do something for Morgan; I am afraid these Waterloo men may cut him out, for John Bull is always pleased with his last toy. I will enclose you a letter he sent my mother, wishing to set up a grocer's shop and requesting her interest. If he attempts anything of the kind he will be ruined to a certainty.

By my last letter from home, I find my mother is at Woolwich expecting another young Baynes. I must put by this extra 2s. a day for them. You have a great deal to answer for in taking him over to Mottingham; however, if you have four more of the same sort I will take them all off your hands.

You know, of course, we have lost poor Lloyd;[1] it is a happy release for him, poor fellow, his pain had been excruciating in the extreme from the moment he received his wound; this makes the ninth officer we have lost at Waterloo.

I am in daily expectation of a visit from *the lawyer;* I have told him to bring lots of money. I am laughing at this moment, fancying I see you cutting up the chickens at Mrs. Moffats. You certainly did look uncommonly happy. Do not interrupt Mr. Metcalf at breakfast or dinner, but when you have an opportunity make my best respects to him. I am glad to find you thought my likeness good, my mother wrote me word of Cussy's exclamation. I hope by this time Engleheart has finished three or four for you; your father told me he certainly would go to him.

I suppose this will find you at Brighton; now you really cannot do better than to take a run over and spend a few days with me. You may tell Mrs. Douglas I will take the greatest care of you and Cussy, that I promise not to scratch you. I am now quartered within half a mile of Beauvais, which cannot be a long day from Dieppe. We have excellent shooting here, abundance of hares, partridges and quails; it will be some amusement to you to see me shoot. It seems quite uncertain how long we are to be kept in this country. I have seen two French papers this morning, one says two months, the other four years; go when we may, I think they will make pretty free with each others throats. Sentence has been passed some time since upon Labédoyère,[2] but they seem afraid to carry it into

[1] Kane's List, No. 922.

[2] Labédoyère was Colonel of a regiment which met Napoleon and joined him in the spring of 1815, and was one of the Emperor's aides-de-camp at Waterloo. He was shot, though he might easily have escaped.—*See* Bourrienne (Phipps edition), p. 542, note 6.

execution. The fellow I want to have brought up is Lefebvre;[1] think of their having put Soult[2] in the second article.

You can form no idea what destruction the Prussians committed. I was quartered in a large town on Jerome Bonaparte's estate; they had destroyed every piece of furniture and window in the whole place. As for Jerome's palace, which he had quitted only a week before, most superbly fitted up, they had absolutely pulled the wainscots out of every room; green and hot-houses they had also torn to pieces, and thrown the whole of his library into the fish-ponds. I had very little, indeed no pity for the French, having witnessed their work in Spain and Portugal. In many places the French plundered the towns through which they passed, fearing the Prussians would otherwise do so.

Now I think I have kept you quite long enough, my dear John; I will conclude with requesting you will make my very kind regards at Twyford, Somerset Farm and Woolwich. Give my love to Cussy and Willen, tell them I hope they pay great attention to their dancing and singing. I shall expect to find them very much improved on my return. Pull Master Rob's ear for me and make him *growl*.

Believe me ever your very

Affectionate friend,

Tom Dyneley.

In conclusion it may be recorded that the writer of these letters was very popular in the Regiment. An officer who served under him wrote the other day, as follows: "Colonel Dyneley commanded the R.A. when I was in Canada. He was a great favourite with all who knew him; kind, genial, hospitable and full of good stories."—Ed.

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[1] Lefebvre-Desnouettes was taken prisoner in the cavalry action at Benevente in 1808, and was accused by the English of breaking his parole. He commanded the light cavalry of the Imperial Guard at Waterloo. He escaped from France in 1815, having been engaged in a plot for Napoleon before the landing and lost his life in a shipwreck.—Bourrienne (Phipps edition), Vol III., p. 542, note 2.

[2] Soult did not join Napoleon before the King left the country as Ney did, and so was not tried

RANGE OFFICER.

BY

LIEUTENANT H. L. GRIFFIN, R.A.

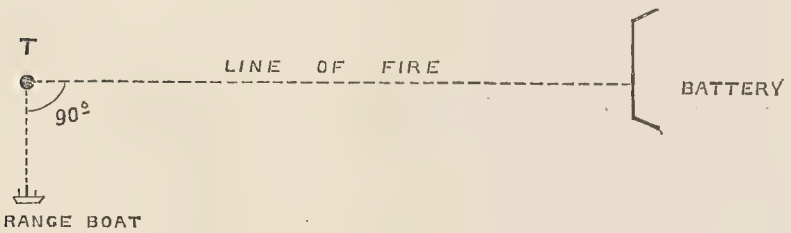
UNDER above heading, "Garrison Artillery Drill, 1895," Vol. I., says on page 497 :—"With stationary targets, where it is difficult to know with any degree of accuracy the distance of the range-boat, small buoys placed at known distances on either side of the target would greatly assist the range officer in making reliable estimates of the distance — or +."

Small buoys, however, are not always available, and where there is much tide, they will swing considerably at the turn and are, therefore, sometimes misleading.

A plan I always use, and which answers very well when the range-boat and target are both stationary, is one that is, perhaps, known to the majority of officers but, as I have never seen it written down, I will describe it.

(1). Find out the height of your target; this could probably be done on the range-boat.

(2). Anchor the range-boat as nearly as possible in line with the target and at right angles to the line of fire.



(3). Take a strip of cardboard, about 18 inches long, and hold it at arm's length so that the end of a long edge appears to be in line with the top of the target: note where the water line of the target appears to cut the edge of the cardboard, then this distance will represent the height of the target.

4). Set off this distance along the edge of the cardboard and the range officer is provided with a scale.

(5). When a round is fired the range officer holds his cardboard so that the scale is parallel to the line of fire, and with the edge of the target opposite the centre division of the scale. He notes whereabouts on his scale the projectile appears to fall and, by counting off the divisions right or left from that which is opposite the target, he can tell almost exactly the distance 'short' or 'over' of the round. He must, of course, remember to keep his arm extended while using the scale and, if the range-boat or target moves its position he must make a fresh scale, but this only takes about 2 minutes. For example, if the height of the target is 6 feet he has a scale of yards or feet to show 2 yards or 6 feet or less if he chooses to sub-divide it: the scale should be numbered outwards from the centre division and would look something like the following :—

a b is the apparent height of the target (say 6 feet) as found by par. 3.

COMPETITIVE PRACTICE IN THE GARRISON ARTILLERY AND ITS EFFECT ON THE TRAINING OF OFFICERS AND MEN.

BY

MAJOR P. SALTMARSHE, R.A.

Competitive practice before 1891.

PREVIOUS to 1891 shooting competitions in all branches of the artillery were, as we know, confined to individuals. A written examination was held and the six N.C.O.'s and men who obtained the greatest number of marks fired so many rounds a-piece at a standing target, the results were added to those obtained in the paper work and money awards allotted accordingly.

Except among the competitors themselves these proceedings evoked no great interest, and this kind of prize shooting had but little effect on the training of the battery generally.

Introduction of present system.

The introduction of the present system of Competitive practice in 1891 was certainly a happy thought, and the Regiment is much indebted to the officer to whom it occurred in the first instance.

Alterations in the system in 1893 and 1895.

Since its introduction in 1891 two important amendments have been made to the rules for carrying it out in the Garrison Artillery.

In 1893 it was ordered that half the gun-layers employed at the practice should be selected at random by the chief umpire from all the paid gun-layers of the company, which the battery had now become.

In 1895 it was further ruled that as many gun detachments as possible were to be formed, out of which the chief umpire was to select four at random.

In addition to the above changes, I may mention that, whereas in 1891 and 1892 the Competitive practice was almost invariably carried out when possible at a Hong Kong target, the number of hits on a battle-ship being estimated, since then a Record target has generally been used, and this year, of course, the regulations have enforced the use of the latter among companies competing for the D.-A.-G.'s cup.

Advantages of the present system as compared with the old.

I propose now to discuss, first, the effect of the system generally on the training of the *personnel* of the Garrison Artillery and then deal with the alterations alluded to above.

Quoting from the report of Commandant School of Instruction, Western Forts, on the practice of 1891, page 9, para. 41—

"The keenest interest was evinced by all batteries in regard to the new system of Competitive practice. Without entering on any ample consideration of this system, I would remark that it was felt by all to be a much more thorough test of the efficiency of the battery through all ranks. Far deeper interest was called forth from the officers, and every man of the detachment felt that he was conducing towards the hoped-for prize for his battery."

Effects of the present system on training of officers and men.

All this is true to the letter and, as a battery and company commander, both before and since the introduction of the new system, I cannot speak too strongly in favour of it as compared to the one in vogue before 1891; instead of the interest in the shooting being confined to a few individuals, it is now shared by every one in the company, greater care is bestowed on the preliminary drills of the latter and a commanding officer pays far more personal attention to the training of his officers, gun-captains, range-finders, and especially his gun-layers than he did before.

Disadvantages of the present system.

Good, however, as it is, generally speaking, the system is not unattended by some disadvantageous affects, which I will endeavour to enumerate.

(1.) It induces a commanding officer to train his men more with a view to their doing well at Competitive practice, than to their rendering a good account of a hostile vessel.

With our present launches it is difficult to tow a Record target at more than seven or, at most, eight miles an hour; in practising a company at drill, therefore, a commanding officer not unnaturally selects if possible as objective a sailing vessel or yacht moving at this rate of speed instead of a steamer tearing through the water at 18 or 20 knots, which is what he would probably have to shoot at in actual warfare.

Anyone who has practised at Warden or Cliff End batteries at drill at our slowly moving targets and has then tried to change on to the Jersey boat or a torpedo destroyer, will know well what I mean and how many "fresh lays" there will be, especially with young officers and gun-captains when first practising at the rapidly moving objective.

Again, men are generally trained at drill to lay at a vessel broadside on and seldom at those approaching or going away from the battery direct.

Effect of the present system on P.F.

(2.) One method only of range-finding, the D.R.F. almost invariably, being used for Competitive practice, other methods are more or less sacrificed to it.

In his report for 1891, page 22, para. 58, the Commandant School of Instruction, Golden Hill, states :—

"The D.R.F. system has been more thoroughly worked out than the P.F. Far more time and practice has been devoted to it, the consequence is a far higher degree of perfection has been attained."

Again, in Annual Report of School of Gunnery for 1893, page 17, para. 22—

"Practice with D.R.F. was better than with P.F. throughout."

During his preliminary course of training, rarely lasting more than three weeks, a company commanding officer has a great deal to teach his men, many of whom are employed during the rest of the year. Battalion and company drill, carbine exercise and physical drill must be perfected, some time must be devoted to repository exercises and single gun drill; is it to be wondered then that when fire discipline is taken in hand the P.F. is shirked and, in view of the Competitive practice, all available time given to the D.R.F.

(3.) Under the present system, one day makes or mars a company, it is classed and judged almost entirely by its Competitive firing; sufficient importance in consequence is not attached to the remainder of the annual practice, including shooting with the P.F.

Selection of competing gun detachments and gun-layers by the Chief Umpire.

Dealing now with the regulations as to the selection of competing gun detachments and gun-layers by the chief umpire.

Before 1893 a company commander selected his four best gun-captains, his four best layers and made up his four best detachments for Competitive practice.

In 1893, as mentioned above, this was changed as far as gun-layers went, and out of the four used, the chief umpire now selects two and the company commander the other two out of all the paid gun-layers.

This regulation has, of course, one very beneficial effect, it obliges a commanding officer to bestow great attention on the training of all his layers, and especially on the weakest.

On the other hand it has, I respectfully submit, the following disadvantages:—

(1.) It introduces a powerful element of luck into the competition.

Out of the, say, one hundred men available in the company, I defy any man living to produce twelve, let alone eighteen gun-layers of anything like equal capacity and it makes every difference in the world to a company's chance of success at practice if the two best or the two worst are chosen. I will illustrate this by what occurred last year to my own company.

In 1895 I produced for Competitive practice 14 gun-layers, these might be classed as follows:—

Class (1.) 1 man — absolutely reliable.
Class (2.) 5 men — very reliable.
Class (3.) 5 men — fairly reliable.
Class (4.) 3 men — uncertain.

Out of these I selected the first enumerated and one of Class (2), the chief umpire happened to select two more out of Class (2), so that out of my six best layers four were selected, "two by honours to begin with."

As I expected not a shot was off the line during the practice, but had two men out of Class (4) been taken the result might have been very different; this year I had not the same luck and lost two hits owing to the selection of a young and somewhat inexperienced gun-layer.

(2.) The obligation to keep up so many really well-trained layers necessitates their being changed after pretty well every round during the service practice; this of course does not improve the shooting.

There are really not sufficient rounds allowed for the number of layers; when the ammunition allotted for shooting with P.F. predicting is deducted, two or, at most, three rounds per gun-layer is all he is able to fire before the Competitive.

(3.) The present system of selection of layers prevents, in many instances, men working in their own detachments. This is opposed to the great principle advocated in all branches of the service of keeping always the same men together at their work.

Selection of Competing detachments by the Chief Umpire.

In 1895 and 1896 as many gun detachments as possible had to be produced, out of which the chief umpire selected four for the competition.

This change undoubtedly increased in a company the number of men really efficient at gun drill, with the exception of his D.R.F. squad, his signallers and dial numbers, a commanding officer is now obliged to see that all his men are accurately acquainted with the drill of at least one heavy gun; moreover, he has to keep up more really well-trained gun-captains.

It has the following disadvantages :—

(1.) The element of luck again; this, however, is not nearly so marked as in the case of gun-layers, it is far easier training eight good gun-captains than eighteen gun-layers, and detachments can, of course, be easily equalized.

(2.) Subaltern officers may not have their own sub-divisions under them. This is a serious defect which can, I think, have been hardly appreciated when the regulation was framed. On the most important day of the year to the company, professionally speaking, the chances of selection may take away some of his own men from a subaltern and put him in command of others not belonging to his own half company. Is this desirable ?

Record v. Hong Kong target.

With regard to the use of the Record target instead of the Hong Kong; direct hits when firing at the former are, of course, more satisfactory than estimated ones when firing at the latter, when the judging cannot, of course, be absolutely exact. Competitive practice too at a Record target causes greater pains to be bestowed on the training of gun-layers than if a Hong Kong is used.

The larger target, however, moves through the water less rapidly and has consequently the disadvantage, as pointed out above, of encouraging the training of men at a slow objective; moreover, if struck low, it easily breaks up, in which case firing has to continue at perhaps only a small

portion of the original structure, overs and unders, rights and lefts, having to be estimated, all the disadvantages without the advantages of a Hong Kong accruing in consequence.

This liability to break up introduces another element of luck; a company, which does not destroy the target has a better chance of success than one that early in the practice does so, *e.g.*, if the target is smashed the second or third round, just as the battery commander gets his range, great delay is caused and he has to commence his sequence of fire, so to speak, over again; moreover, it is much more difficult judging the errors of shots if the portion of target left to fire at is so small that the correct line of fire is behind it.

For instance, if a piece of the original target, say twelve feet long remains, a perfect line for the shot is six feet behind it, *i.e.*, where the centre of the original target would have been if it had not been shot away, now if a shot along this line strikes the water eighty or ninety yards beyond the target it looks a good range from a low site battery even through the best of telescopes, whereas if the original target is in existence the battery commander knows at once that an over shot failing to strike it must be at least the permissible error (about 50 yards at 2000 yards from a low site battery) beyond.

The same remarks apply to judging shots falling short of the target.

It may, therefore, make considerable difference in a company's shooting if the target is or is not broken up during the first few rounds.

To sum up: if a Record target could be towed as fast as a Hong Kong, and if it could be so constructed that it would not break up, it is undoubtedly the best to use, under the present conditions it is to my mind a very open question.

Suggested modification in the system of carrying out Competitive practice

Let us now consider whether, without altering the general system of Competitive practice, certain modifications might not be introduced with the object of minimizing some of the disadvantages I have spoken of.

What I suggest for consideration is this:—

(1.) That out of the ammunition allowed to each company for its annual course, a few rounds be handed over to the company commander for elementary practice pure and simple, such practice to be entirely in his hands and to be carried out in whatever manner and with whatever range-finders he wishes, this will enable him to practice his untried gun-layers, etc.

(2.) That the whole of the rest of the practice be *Competitive*, the ammunition being allotted in equal proportions to P.F., to P.F. as D.R.F., and to D.R.F.

(3.) That a fair proportion of rounds be fired at a single Hong Kong, or the fastest target obtainable and that it be arranged that most of these rounds are fired when the target is being towed *with* the tide. Under such circumstances 12 to 15 miles an hour is attainable with a steamer of the "Osprey" type.

Suggestion number (2) at once sweeps away the disadvantages of the present system of selection of gun detachments and gun-layers for the competition by the chief umpire, for *all* gun detachments and *all* gun-layers can now take part in the Competitive practice.

Subaltern officers can throughout command men of their own half companies and layers can be employed with their own sub-divisions. The element of luck vanishes.

This suggestion, moreover, at once prevents preference being given to any particular method of range-finding and obliges a commanding officer to train his men equally carefully in all.

I submit also that this arrangement is a truer test of the efficiency of a company than a single day's practice, which may be marred by bad weather or a crowded range.

Suggestion number (3) encourages a commanding officer to train his men at rapid objectives.

Practice at an objective moving direct on the battery.

Until an automatically moving one is introduced it is, of course, impossible to shoot at a target approaching or departing from a battery direct, and in consequence men are rarely trained to lay on such an objective, some practice might, perhaps, be obtained by anchoring 5 or 6 barrel targets in line and shooting rapidly at them in succession, taking the furthest first to represent a vessel approaching and the nearest first to represent one steaming away from the battery.

I believe a Brennan torpedo has been used to shoot at, but the installation below Cliff End battery is, I fancy, the only one possibly available for this purpose.

Disadvantages of proposed changes.

I am aware that these proposed changes have their disadvantages, some companies do not get the same chance of practising with P.F.'s that others do; on the other hand, under the present arrangements, companies, who man casemated forts where a D.R.F. is never used and where men never lay or practice with straight-edged sights, have to carry out their Competitive practice with this method of range-finding.

These matters can be equalized when grouping companies for the competitions. Combined practice also creates some difficulties, as one fort is easier to shoot from than another, still this can be to a great extent neutralized by having two days' combined shooting, when, of course, one company would take one fort one day and another another.

The duties of the umpires would, undoubtedly, be more complicated and arduous, but still, I think, would present no insuperable difficulties.

Should the idea of spreading the Competitive practice over several days' firing be not contemplated, I would, in order to eradicate the element of luck, suggest the following modifications in the selections of gun detachments and gun-layers by the chief umpire.

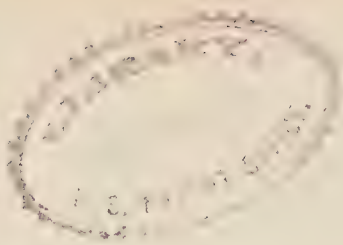
Each *half company* to produce as many detachments as possible—as a rule this is four, or two per sub-division—the chief umpire to select one out of each sub-division or, at anyrate, two out of the half company, this will ensure the half company officer having command of his own men and will equally ensure the same number of well-drilled detachments as under the present system.

With regard to layers, I should propose that two per competing detachment be told off and that they be changed in the middle of the

practice. This will prevent any luck as to selection and will ensure the layers being employed with their own sub-divisions.

I am aware that this arrangement necessitates the production of only 8 gun-layers for the Competitive, but a commanding officer would have to keep up at least 4 or 5 more in reserve in case of casualties among his 8 best.

Differences in local conditions would probably necessitate the biennial competition for the D.-A.-G.'s cup being confined to one day's practice only, still this need not interfere with the adoption of the methods I have suggested for the group prizes. Competition for D.A.G.'s cup.



THE DUTCH EXPEDITION

TO THE

ISLAND OF LOMBOK, 1894.

BY

MAJOR W. L. WHITE, R.A.

The Island of Lombok.

The Island of Lombok (also called Tanah Sassak and Selaparang) is one of the line of islands stretching away from the south-east point of the Island of Java. It is the second on the string, that next to Java being the Island of Bali.

Area. It has an area of 1370 square miles.

Formation. It is, generally speaking, square in shape, being formed of two small parallel mountain chains connected by a low range of hills. The skeleton of the island is, thus, not unlike the letter H laid upon its side; thus "I," the connecting chain of hills being not quite in the centre of the figure.

Mountains. The northern chain is volcanic, the Peak of Lombok, or Mount Rindjani, attaining a height of 12,460 feet (Wallace) and having five cones of eruption, the centre one of which, A.P.I., is the present vent and is continually active. The western end of this range is called Mount Poenikan (4790 feet) and Mount Wangsit (2803 feet).

The southern range is of tertiary formation and does not attain to the height of the northern ridge. Its highest point is 2395 feet.

The connecting range of hills, the Sessan or Tengsan, attains a height of about 1100 feet.

Plains. To the west of this chain of hills lies the plain of Materam, in which stands, or stood, the capital of the island, Materam. The plain to the east is much smaller.

Rivers. The north and south coasts being very steep, the rivers are few and short, but become dangerous mountain torrents during the monsoon. There are a few unimportant streams on the eastern coast.

The principal streams take their rise in the Peak of Lombok and flow westwards, through the plain of Materam. They are inconsider-

able in volume and fordable in many places, but, owing to the proximity of the mountains, are liable to sudden floods during the monsoon. The principal streams are the MENINTING, ANTJAR, DJANKOE, NARMADA (called BARNJAK in its lower course) and the BABAK.

Coast line harbours. The northern and southern coasts are very precipitous and are difficult of approach during the monsoon.

Anchorages. On the west coast there are several good anchorages :—

AMPENAN, open roadstead, steep beach, heavy surf during W. monsoon.
PADANG REAK „ „ „ „ „ „ „ „
LABUAN COMBAH „ „ „ „ „ „ „ „
TANDJOENG KARANG „ „ „ „ „ „ „ „
but partially protected by a reef.
LABUAN TRING, good harbour protected during both E. and W. monsoons, entrance rather narrow.

On the west coast :—

LABUAN HADJI, PIDJOE BAY, LOMBOK BAY and KENANGA offer good and safe anchorages for large vessels. The two first are regularly visited twice a month by the steamers of the Royal Packet Company.

Climate. Health. The climate is, generally speaking, like that of Java. It is not very healthy, owing, it is said, to the volcanic exhalations. The difference of temperature between day and night is great. Fever is most prevalent after the rice harvest and epidemics of small-pox and syphilis have repeatedly ravaged the island.

Flora and fauna. The flora and fauna of the island are transition between those of Asia and those of Australia. Wallace traces the geographical boundary between Asia and Australia along the channel separating Lombok from Bali.

Historical note. The Island of Lombok was formerly inhabited by a number of small independent tribes, called SASSAKS, who embraced Mahomedanism shortly after A.D. 1500. About 1750, one of the petty chieftains, quarrelling with his neighbours, called in the assistance of the Hindoo Rajah of Karang ASEM in the Island of BALI. The latter came over and, after a succession of wars, the whole of the petty States were united under the Hindoo Rajah of Materam, who thus became the sole ruler in Lombok and whose title was Rajah of the Island of Lombok and of Karang Asem in the Island of Bali.

Inhabitants. Lombok contains about 656,000 inhabitants, of whom 600,000 are Mahomedan SASSAKS, 50,000 Hindoos from BALI, 6000 foreigners of Eastern nationality and a hundred or so of Chinese and Arabs.

The Sassaks, the original inhabitants of Lombok, occupy the entire eastern and southern portions of the great plain of Materam and the Balinese the west coast and the north-west portion of the plain. A small number of Sassaks live in the territory of the Balinese and were called "renegades" by the other Sassaks.

Government. The Rajah of Lombok was a despot and, with his Balinese chiefs, maintained the most grinding feudal rights over the persons and properties of his Sassak subjects. The RADENS, or councillors, descendants of the Sassak nobility, enjoyed some few privileges, but were not

permitted to occupy posts under Government. The Arab immigrants were among the most trusted advisers of the Hindoo Rajah. In 1894 the Rajah, who was then over 80 years of age, was entirely under the influence of his illegitimate son, ANAK MADEH, a cruel and tyrannous man, who had altogether supplanted the heir-apparent, ANAK KETOET.

Fighting strength.

In 1894 the fighting strength was estimated at Balinese 10,000, Sassaks 100,000.

Arms and training.

For politic reasons the Balinese had taken care that the Sassaks, who were perpetually in a state of rebellion, owing to the oppression under which they groaned, should be little skilled in the use of arms, whereas the predominant race were almost all trained to arms. There were no regular troops, with the exception of the Royal body-guard numbering some 150 men. The arms were the krees, or Malay dagger, short sword, lance, many muskets and rifles, including breech-loading and repeating weapons, a number of native cannon of small calibre ("lillas") and some 40 to 50 cannon of various systems of which, however, the carriages, where there were any, appear to have been in very bad condition.

On the march, advanced and rear-guards are provided.

Methods of warfare.

The attack formation is somewhat that of a Zulu impi. A line, or rather phalaux attempting to envelop the enemy's flanks. This phalaux is preceded by "amok runners" (the "ghazi" of the country), who dance as they go and appear utterly regardless of death or danger. The chief gives his directions from a safe place in rear.

Strategic situation.

Against the Dutch, however, the Balinese modified these tactics resorting to surprises, night attacks, and the holding of the strong defensive positions offered by the narrow streets of their towns and the fortress-like nature of the individual houses.

Points of importance.

The roadstead of AMPENAN, at the mouth of the DJANKOE river, is, so to speak, the key of the Materam territory. Before the outbreak of the war it was visited by ships of all sorts and is, during the E. monsoon, a good roadstead. Large vessels can lie at anchor at a distance of 750 yards from the shore. A broad, high road, planted with fig trees, runs from Ampenan, for more than two miles, to Materam the capital.

Nature of towns.

MATERAM is regularly built in blocks, with streets running at right angles to one another. The houses are thatched and are built of mud and stone. Each house, with its out-buildings, forming a quadrangle with an inner court, is surrounded with a wall, in which the few windows are high up and the doors small. Each homestead therefore forms no contemptible fortification and each is capable of separate defence. In the towns the abutment of one walled enclosure on another presents streets completely walled in on either side. The above points are of great importance, as accounting for the desperate street fighting which took place. In the centre of Materam, at the great cross roads, stands the Royal palace, which was not much used by the Rajah, who preferred to live at one of his numerous pleasure residences on "POERIS," the principal and favourite of which was at TJAKRA NEGARA, about two miles east of Materam.

Nature of country.

The country around Ampenan, Materam and Tjgkra Negara is

devoted to the growing of rice. Owing to the extensive suburbs of the two latter places the open space between them is very narrow.

The names of the other "Poeris" are GOENDENG SARI, NARMADA and LINGSAR.

Another important point is PRAJA, which was the residence of the GOO-ROO, or Mahomedan High Priest, BANGKOL.

Roads. Contrary to expectation, the Dutch found the roads in the interior excellently made, well kept up and broad beyond the average.

Devasted belt of country. If a line be drawn from PRAJA to the ruined village of BATOE KLIAN, there lies to the west of it a belt of country, some two to three hours journey across, which has been entirely devastated by the Balinese as a punishment for former Sassak rebellions.

CAUSES LEADING TO THE LOMBOK EXPEDITION.

Treaty of 1843. In 1843 the Rajah of Lombok concluded a treaty with the Dutch-Indian Government, in which he in article :—

1. Acknowledged the Island of Lombok to be the property of the Dutch-Indian Government.

And in the following articles promised :—

2. Never to cede the island to any white nation or to make any treaty with any such nation.
3. To send an Embassy to do homage at Batavia every three years.
4. To receive as his guests all emissaries of the Government.
5. To protect shipwrecked persons.
6. To protect trade.

In return the "Government declares that as long as the Rajahs accurately observe the above conditions, no endeavour whatever will be made to take possession of the island or to interfere with the internal Government thereof, which Government is left entirely in the hands of the Rajah."

Treaty of 1849. A treaty agreeing in the main with the above was ratified in 1849.

Revolts by the Sassaks. 1855. Goaded to desperation by the revolting tyranny of the Balinese, a general uprising of the Sassaks took place in the eastern portion of the island in 1855, which was put down and punished by a fearful massacre.

1882. In 1882 a great conspiracy was discovered, which was likewise punished in a most barbarous manner, but this in no wise daunted the Sassaks, who, from this period, commenced the movement, which, though they suffered many checks and reverses, must finally have freed themselves from the Balinese yoke, a consummation hastened by the Dutch action in 1894.

During the years of agitation that followed 1882, the principal seat of the Sassak strength was on the east coast and found its head at

Praja, where the Mahomedan Priest, the Goo-Roo Bangkol, held sway.

Before the violent Sassak outbreak of 1891, these unfortunate people, 1891.
under the guidance and leadership of Laden Rorens, applied to the Dutch Resident of Bali for protection. But the Dutch-Indian Government resolved not to go beyond its treaty rights, especially as its own relations with Lombok were somewhat strained, for the Rajah of Dutch grievances.
Lombok had, of late, in his communications with the Dutch Resident in Bali, adopted a most unbecoming tone. The Dutch-Indian Government, therefore, contented itself with watching the course of events and sending war-ships to Lombok waters to prevent the importation of arms and reinforcements.

In the latter half of 1892, the Sassaks, thanks to their superior 1892.
numbers and their devotion to their cause and, in spite of the superior weapons, training and resources of their oppressors, began to gain ground and the Rajah sent to Bali for reinforcements. Two steamships, flying the Lombok colours and bringing reinforcements, arrived at Ampenan, but were stopped by the Dutch men-of-war. After a great dispute with the senior commander, Captain Bruce, the two vessels were placed under embargo and removed to Soerabaja, where they remained. The Rajah then attempted to draw the British Government at Singapore into the quarrel, in which he met with not the slightest success, but which added another count to the heavy score already against them. Hereafter the Dutch vessels were permanently boycotted.

In August 1893 Mr. Damenbargh, the Dutch Resident in Bali, 1893.
accompanied by Controller Liefrinck (whose name is perpetually recurring in the history of the expedition), went to Ampenan to present to the Rajah a memorandum setting forth, under nine heads, the grievances of the Dutch-Indian Government and finally stating that the Governor-General was sending an autograph letter to the Rajah.

This letter the Rajah refused to receive.

Such was the state of affairs when, in October 1893, the Governor-General, Pijnacker Hordijk, was relieved by Jungheer van der Wijck. It was probably owing to the opinions of the former (who afterwards stated in the 1st Chamber, that he disapproved of a hostile attitude being observed towards a kingdom with which the Dutch-Indian Government had nothing direct to do) that affairs had been brought to such a pitch—in which they remained for some little time after the appointment of Van der Wijck, who appears to have held totally different views.

Matters were now approaching a crisis. The Rajah endeavoured to get advertisements inserted in the "*Straits Times*" at Singapore repudiating any connection with the Dutch-Indian Government.

Raden Lorens, the Sassak leader, having died, the Sassak movement lost cohesiveness. Owing to the rebellion, the country had not been properly cultivated in parts—and in other parts had been devastated, hence the people were in the utmost distress for want of food.

In March 1894 the Rajah sent to Batavia to say that he would now receive the Governor-General's letter. On June 5th Controller

Liefrinck landed with a letter containing an ultimatum requiring apologies and guarantees for future good behaviour. The Rajah avoided receipt of this letter, which was accepted for him by ANAK KETOET and ANAK MADEH. Three days were given for consideration.

On June 11th further delay was asked for and refused. The Government Commissioner returned to BOELELENG.

THE FIRST EXPEDITION.

On 13th June, 1894, it was decided to send an expedition.

The several detachments of the expeditionary force left :—

Batavia, 29th and 30th June and 1st July.

Semarang, 2nd July.

Soerabaja, 3rd July.

Nine steamers were chartered for the conveyance of the troops and the SS. "MAETSUIJKER" was placed at the disposal of the Commander-in-Chief as Staff ship.

The squadron, in the waters east of Java, consisted of:—

Frigates, "Koningin Emma" and "Tromp."

Armourclad, "Prins Hendrik."

Protected corvette, "Sumatra."

Flotilla vessel, "Borneo."

Despatch vessels, Nos. 95 and 101.

Revenue vessels, "Cyclops" and "Argus."

The Command-in-Chief was given to Major-General J. A. Vetter, with Major-General P. P. H. van Ham as second in command.

Transport.—

Much of the transport through these rice-growing countries, covered in parts with thick undergrowth, having to be done by man transport, the Dutch make use of their convicts as coolies. With the prospect of the remission or mitigation of their sentences as a reward of good behaviour, these men are said to have worked admirably and were preferred to free coolies. Many of them displayed the greatest gallantry in the desperate street fighting that took place and on parties of their volunteers fell the duty of carrying the scaling ladders. It is believed that many of these received their freedom after the campaign. It is believed that they were armed with a side-arm of the sword-bayonet description.

The distribution of the 1718 convicts mentioned in the table was as follows :—

General Staff—8 for carriage of archives and grass-cutters.

6th battn.—4 headmen and 108 convicts—16 per company for carriage of ammunition, 8 for cooking pots and 3 for pioneer tools.
7th and 9th battn.—as for 6th.
Cavalry— 1 headman, 24 convicts—4 for cooking pots and 20 grass-cutters.
Artillery 2 „ 44 „ 12 „ „ „ „ 32 „
Engineers 2 „ 54 „ 6 „ „ „ 34 reserve equipment and 14 telegraph section.
Topographical Service— 4 convicts—occupation not stated.
Military Administration Staff 4 „ carriage of archives.
„ „ Regtl. 10 „ 2 per unit for carriage of archives.

Medical Service.—

Field Hospital— 2 headmen, 48 convicts.
6 Ambulances—18 „ 456 „

For each ambulance (composed of one medicine and one surgical chest, 15 dhoolies — tandoe — and two improvised field stretchers), four for carriage of medicine chest, four for surgical chest and four for each dhoolie or stretcher.

General Train.—

Twenty-seven headmen and 742 convicts—for care of draught and pack-horses, carriage of provisions, transport of *matériel* and carts, sweeping and clearance of ground and collection of sick and wounded, etc. To the above add 55 2-horse carts, with 120 draught and 100 pack-horses.

The train was, generally speaking, divided into regimental and general transport, the latter working along the trunk lines and keeping depôts supplied.

The historian of the war (W. Cool) hopes that in future there will be an organised service in time of peace.

It will be seen from the above distribution of the transport that there is no provision made for the carrying of the mens' kits. Each man, whether European or native, has to carry his own kit, including a chopping knife ("kapmes"), a very useful article in bivouac or where undergrowth is thick. The N.-C.O. of each section (one man in nine) carries a sawing knife ("zagmes") in lieu.

For detail as to dress, weights carried, etc., stores comprising the engineer reserve equipment and other details, *see* "Hand-book, Dutch Army," 1896. All reserve stores, etc., are made up in loads of 44lb. for coolie transport.—Hand-book, p. 106.

Press correspondents were not allowed to accompany the force and the officers were specially requested not to write on service subjects to their relations and friends.

The 13th battalion of infantry was prepared for embarkation at Soerabaja as a reserve and, to bring it up to strength, all available men at Batavia, who were fit to take the field, were sent to Soerabaja.

In the early morning of the 5th of July the whole of the expeditionary force was united in the roadstead of Ampenan.

The force consisted of (*see* table, p. 570).

	Combatants.			Non-Combatants.						Horses.			Mules.	Remarks.
	Officers.	Other Ranks.		Officers.	Other Ranks.		Servants.	Convict Estabt.		Officers.	Troop.	Pack and Draught.		
		Europeans.	Natives.		Europeans.	Natives.		Headmen.	Convicts.					
H.Q's. and Personal Staff	4	...	...	...	...	...	12	...	...	12	...	...	...	
General Staff, C.S.O., Major A. J. Hamerster	4	5	2	...	...	...	10	...	8	3	2	...	...	
Topographical Service	...	...	...	1	2	...	4	...	4	...	...	...	...	
Artillery Staff, C.R.A., Major Rost van Tonningen	2	1	...	...	...	...	5	...	...	2	...	...	...	
Q.M.G. Intendance, Major L. C. van Berg	...	...	...	4	2	...	10	...	4	2	...	...	...	
Medical service, P.M.O., C. J. de Freijtagi	...	...	...	2	1	1	5	...	...	1	...	...	...	
Civilian staff (Auditor, Chaplains, Field Post)	...	...	...	5	2	...	18	...	...	...	...	...	...	
Infantry—														
6th Battn., Lt.-Col. van Bijleveldt	19	332	256	2[a]	5	3	30	7	186	2	...	...	...	2 European, 2 Amboynese Coys.
7th " Major van Blommenstein	18	333	242	2[a]	5	3	30	7	186	2	...	...	...	2 " 2 Maduraese "
9th " Lt.-Col. van Lawick van Pabst	17	333	242	2[a]	5	3	30	7	186	2	...	...	...	2 " 2 Javanese "
Artillery—														
Field, 10th Co., Capt. Temminck	3	33	12	...	...	...	...	...	...	3	33	...	...	4 7 cm (2·756-in.) B.L. guns.
Mountain, 5th Co., Capt. Manders	3	37	28	...	...	...	...	...	...	3	9	...	28	4 " " " "
Garrison, Lt. Hemmes	1	13	14	...	...	...	23	2	44	1	12	...	2	4 Cohorn mortars.
Park and Reserve	2	40	46	...	...	...	...	...	...	2	13	...	7	2 12 cm (4·72-in.) B.L. guns. 20 2 cm (7·87-in.) mortars.
Cavalry—Half 3rd Sqn., Capt. Raaijmaakers	3	42	36	...	...	...	7	1	24	3	64	...	...	
Engineers—Field Det. Telegraph Det., Park	3	56	33	...	...	...	8	2	54	1	...	...	...	
Administration—Artill'ry, Cavalry, Engineers	...	...	...	1	3	...	3	...	2	...	...	...	...	
Ambulance— " " "	...	...	...	1	4	3	2	3	76	...	...	...	...	
Military Administration—														
Field hospital	...	...	...	1[b]	2	...	3	...	...	...	...	...	...	
Central depôt	...	...	...	1[b]	3	...	3	...	...	...	...	...	...	[a] 1 Quarter-Master and 1 Surgeon.
Advanced magazine	...	...	...	1[b]	1	...	1	...	...	...	...	...	...	[b] Quarter-Master.
Provision ship	...	...	...	1[b]	1	...	2	...	...	...	...	...	...	[c] 120 draught and 100 pack-horses.
Hospital ship	...	...	...	1[b]	1	...	1	...	...	⋮	...	...	...	
Medical Service—														
Field hospital	...	...	...	6	23	12	14	2	48	...	...	...	...	
General Train—														
Train, Capt. Schmidhamer	...	...	...	3	24	5	7	27	742	2	...	220[c]	...	55 2-horse carts.
2 Ambulances	...	...	...	2	8	6	7	6	152	...	...	...	...	
Administration	...	...	...	1	1	...	1	...	2	...	...	...	...	
Totals	79	1225	911	37	93	36	236	64	1718	41	133	220	37	

The Landing.

In the very early morning of July 5th, 1894, the fleet anchored in the roadstead of Ampenan. July 5th.

The same morning the new ultimatum demanding:—

(1.) Apologies. (2.) Abdication of the aged Rajah in favour of the heir-apparent, Anak Ketoet. (3.) A new treaty. (4.) Payment of expenses; was sent on shore with a statement that an answer must be delivered by sunset on July 6th.

At 4 p.m., July 6th, three Balinese chiefs came on board the "Maetsuijker" with the information that the ultimatum had been received and sent on to the Rajah, who was then at Kotah Rajah, some 28 miles from Ampenan, and that it was thus impossible that an answer could be expected within 24 hours. July 6th.

The order for disembarkation was then given. Disembarkation.

The men-of-war were anchored some 500 yards from the shore, between them and the shore lay some 15 armed boats, in two divisions, to cover the landing. These boats lay at wide intervals and in each interval lay a steam-launch from the transport fleet. Each launch towed four boats containing the landing party.

The landing party, under Major-General van Ham, consisted of the 9th battalion, two companies of 7th battalion, four mountain guns, the engineers and two ambulances (say 800 rifles and four guns). Each infantry boat contained a squad of 30 men, complete with arms and equipment.

At 6.30 a.m. the signal to advance was given; at 6.50 the landing was effected unopposed and at 7 a.m. the Lombok flag, hoisted on a tall flag-staff on the shore, was hauled down and that of the Dutch hoisted.

At 7.30 a.m. the remaining companies of the 7th battalion and the 6th battalion were in the boats and the cavalry had begun to be disembarked.

It being rumoured that the enemy was collecting at Tjakra Negara, three companies were sent out to reconnoitre—one along the road Ampenan-Rembega, to near the latter point; a second to within 850 yards of Materam and a third about a mile in the direction of Tandjoeng Kerang. No enemy was met and the troops returned to bivouac at Ampenan. Reconnaissance.

During the day Balinese envoys presented themselves saying that, if the troops were re-embarked, the Rajah would treat with the Commander-in-Chief on board ship. Answer was given that no further letters would be received from the Rajah. July 6th.

During the night, at 3 a.m., the troops stood to their arms, alarm having been given by a fire, supposed to be work of spies, breaking out in the Chinese quarter of Ampenan. The fire was extinguished at 5 a.m. Night alarm.

This day was employed in the disembarkation of stores, in which July 7th. Disembarkation of stores

the natives gave willing assistance. The encampment at Ampenan, was put in order *but was not fortified.*

July 8th. Reconnaissance.

On July 8th, starting at 6 a.m., the 6th battalion, with cavalry and two mountain guns, reconnoitred by TANDJOENG KARANG and SEKARBELA to PASINGAHAN without meeting the enemy. At Sekarbela GOESTI DJILANTIEK, a chief of KARENG ASEM in Bali, reported himself to the Commandant of the column, Major-General van Ham, in order to show his fidelity to the Government and said that, in two days, he would pay his respects to the Commander-in-Chief. He also said that the Rajah was at TJAKRA NEGARA and that the capital, Materam, was not fortified—a fact verified by the reconnoitring party.

Goesti Dilantiek.

This GOESTI DJILANTIEK was a sub-chief of the Rajah (who was also suzerain of the small kingdom of Karang Asem in Bali) and had come over with some 1200 men, of whom 200 were armed with rifles and the rest with species, etc., to the assistance of his suzerain. This body was encamped at BATOE DJAI, near PRAJA, in the southern portion of the island.

July 9th.

On the 9th of July Goesti Djilantiek paid his respects to the Commander-in-Chief at Ampenan and stated that he wished to disassociate himself from the Rajah of Lombok. He was willing to send his force back to Bali at once and himself remain behind if required. The Commander-in-Chief accepted and ordered that the force should be embarked in six or seven days time at PADANG REAK or at LABUAN TRING. Their weapons were to be sent on board at once and all but the fire-arms would be returned on disembarkation.

Goesti Djilantiek left Ampenan at midday ostensibly to repair to Batoe Djai to prepare for the withdrawal of his force. He first, however, repaired to Tjakra Negara, where he told the old Rajah and ANAK MADEH that resistance was impossible and that they had better submit at once. He is also credited by the Dutch with the inception, at this time, of the treachery which cost the Dutch so dear on the night of the 25th, 26th of August and, later, cost the Rajah his crown and the country its independence.

July 10th.

On the 10th of July the Commander-in-Chief received a letter from the Rajah in which the latter acceeded to all the demands set forth in the ultimatum, with the exception of the surrender of ANAK MADEH, of whom he was afraid. He was told, in reply, that the ultimatum must be accepted in its entirety and that he could, if necessary, put himself under the protection of the Dutch troops.

July 11th. Reconnaissance in force.

The whole force, three battalions, four field and four mountain guns, the half squadron of cavalry, the engineers and train (with three days supplies), marched from Ampenan in the direction of Materam. The column also took with it two of the 12^{cm} (4·72-in.) B.L. guns drawn by 40 coolies—to be brought into action, if necessary, on the great, straight (50 to 100 feet broad), and practicable road from Ampenan to Materam. No difficulty was experienced in traction.

The order of march was two battalions and eight guns in first line and one battalion and the cavalry in reserve. The reason of this strange position for the cavalry is stated by Cool (p. 255) to be that

the road to be followed and the surrounding country were entirely open and well known, the objective Materam, was in full view of the column and, moreover, an attack by the Balinese in the open was little likely (a bit of special pleading which will scarcely hold water).

During the absence of the force, Ampenan was occupied by a landing party from the fleet, under Lieutenant and Captain L. C. Rovers, as follows:—

Right division—50 men of the "Prins Hendrik"
" " 60 " " " "Tromp."
Left " 121 " " " "Konningin Emma."
Artillery—Four 7·5 cm (2·953-in.) B.L. guns with an escort of 25 men of the "Sumatra."

Just as the column started, a letter was brought from the Rajah, praying for forgiveness and stating that Anak Madeh had committed suicide. He also asked that the troops should proceed no further, but this was not acceded to. July 11th (continued).

The column, however, halted while Controller Liefrinck went forward to Tjakra Negara to verify the death of Anak Madeh. The latter, who had been offered the alternative between death and banishment, had not yet killed himself when Mr. Liefrinck arrived, but did so shortly afterwards at the instance of Goesti Djilantiek.

On Mr. Liefrinck's return, the column again pressed forward, but the advance assumed the peaceful aspect of a military promenade, bands playing at the heads of the regiments, etc.

At 3.30 p.m. the Commander-in-Chief arrived at the palace of Tjakara Negara and ordered:—

6th Battalion, 4 mountain guns, section of engineers and 1 ambulance to bivouac at Tjakra Negara.

7th Battalion, 4 field guns and 1 ambulance to bivouac in the rice-fields between Materam and Tjakra Negara.

9th Battalion and the cavalry to return to Ampenan to relieve the naval landing party.

At 6 p.m. the Commander-in-Chief visited the aged Rajah.

The bivouac of the 7th battalion and Field Artillery (*see* Cool, p. 259).

A letter was sent to Anak Kelvet, the heir-apparent, at Kota Radja, inviting him to come to Tjakra Negara and Mr. Liefrinck was despatched to the east coast to bring over the leading Sassak chiefs. Nothing was done to entrench the bivouacs as no hostilities were feared. July 12th and 13th.

The 6th battalion, the Field Artillery and cavalry reconnoitred to the royal palace of Narmada (9½ miles from Ampenan) and were well received everywhere. July 14th.

On July 16th the Crown Prince came to Materam and on the morning of the 17th paid his respects to the Commander-in-Chief. On the 18th a conference was held at Tjakra Negara at which the July 16th. July 17th. July 18th.

Crown Prince declared that the demands of the Dutch-Indian Government would be punctually complied with.

During the following days small bodies of troops made excursions into the neighbouring country and gave themselves up to amusement generally.

July 19th. On the 19th Mr. Liefrinck returned, being only accompanied by three Sassak chiefs of minor importance, *the others declared that they would not trust the Balinese.* In consequence, it was resolved that the July 23rd. Sassak chiefs should repair to PRAJA on the 23rd July and await instructions. This, however, they failed to do from fear of the August 4th. Balinese, so, on the 4th of August, General Vetter repaired to the east coast, to Laboean Hadji where all the principal Sassak chieftains were assembled.

The Sassaks promised that, under the guarantee of the Dutch-Indian Government, they would submit themselves to the Government of the Rajah.

August 8th On the 8th of August the General and his Staff returned to Ampenan. The fortifications both of the Balinese and the Sassaks were ordered to be dismantled and disarmed. Goesti Djilantiek's force of 1200 men was ordered to be re-shipped to Bali as speedily as possible.

In order to supervise the execution of these orders, and by the advice of Goesti Djilantiek, the Commander-in-Chief detailed a third of the expeditionary force to make expeditions inland. This force was divided into two columns, each consisting of two companies of infantry, two mountain guns and a section of engineers and was provided with eight days supplies.

The first column, under Lieut.-Colonel van Lawick van Pabst, of the 9th battalion, with two companies 9th battalion (4th company Europeans, Captain Christan and 2nd company Javanese, Captain Lindgreen), two mountain guns, section of engineers, four cavalry orderlies, an ambulance and a train consisting of 80 pack-horses and August 16th 190 convicts, started on the 16th of August and took an easterly direction across the island to BATOE KLIAN.

A second column, under Lieut.-Colonel van Bijlevelt of the 6th battalion, with two companies 6th battalion (1st company Europeans, Captain Creutz-Lechleitner and 3rd company Amboynese, Captain Graeuwen), two mountain guns, a section of engineers, four cavalry orderlies, an ambulance and a train consisting of 80 pack-horses and August 17th 190 convicts, started on the 17th of August for SOEKARARA.

Both these columns reached their destinations unopposed and the work of demolishing the fortifications was proceeded with. The general effect of the movement was that the Balinese troops employed at the front (some 5000 to 8000 well armed men), finding their occupation gone, gradually drifted back to their head-quarters at Tjakra Negara—a fact that was important, bearing on the events that followed, especially when it is remembered that the three main Dutch bivouacs were not fortified.

Goesti Djilantiek and his force had been removed to Telok Combali for embarkation.

During this period also the Garrison Artillery, a hundred or so of invalids, a large proportion of the ammunition and 500 of the useful convicts had been re-shipped to Java and arrangements were being made for Major-General van Ham and a further portion of the troops to go.

The Surprise.

For several days past, rumours had been afloat that the Balinese were meditating treachery, but at head-quarters no credence was given to them. The treaty required but to be translated and signed, some £45,000 of the war indemnity had been paid and implicit trust was placed in the fidelity of Goesti Djilantiek and the Crown Prince. The only disquieting fact was the assemblage of the large number of armed Balinese who had fallen back to the capital in consequence of the action of the two detached columns. August 24th.

The Commander-in-Chief sent for Goesti Djilantiek, but the latter excused himself on the plea of illness. Major-General van Ham and Mr. Dannenbargh then went to see him and he convinced them by his assurances and protestations that there was no foundation for the current disquieting rumours. August 25th.

During the day, however, further rumours reached head-quarters and the Commander-in-Chief ordered the 3rd company, 7th battalion, and two field guns from the bivouac at Materam to Tjakra Negara and sent off a further instalment of £20,000, of the war indemnity, to Materam.

The two Generals, with the military and civil staff, moved their kits from the palace to the bivouac—returned to the palace to sup at eight and returned to the bivouac at 9 p.m.

Distribution of the troops on the night of 25th, 26th August:—

Detached columns.—

Lieut.-Colonel van Lawick van Pabst, 2nd Javanese and 4th European companies.

9th Battalion and two mountain guns, Batoe Klian.

Lieut.-Colonel van Bijlevelt, 1st European and 3rd Amboynese companies.

6th Battalion and two mountain guns, Soekarara.

Bivouacs.—

Tjakra Negara.

Major-General Vetter, Major-General van Ham and Staffs.

2nd Amboynese, Captain Fuhrhop, and 4th European companies, Captain Kamerman, 6th battalion.

3rd Maduraese company, 7th battation.

Two field guns.

Materam.

1st, 2nd and 4th companies, 7th battalion.

Two field guns.

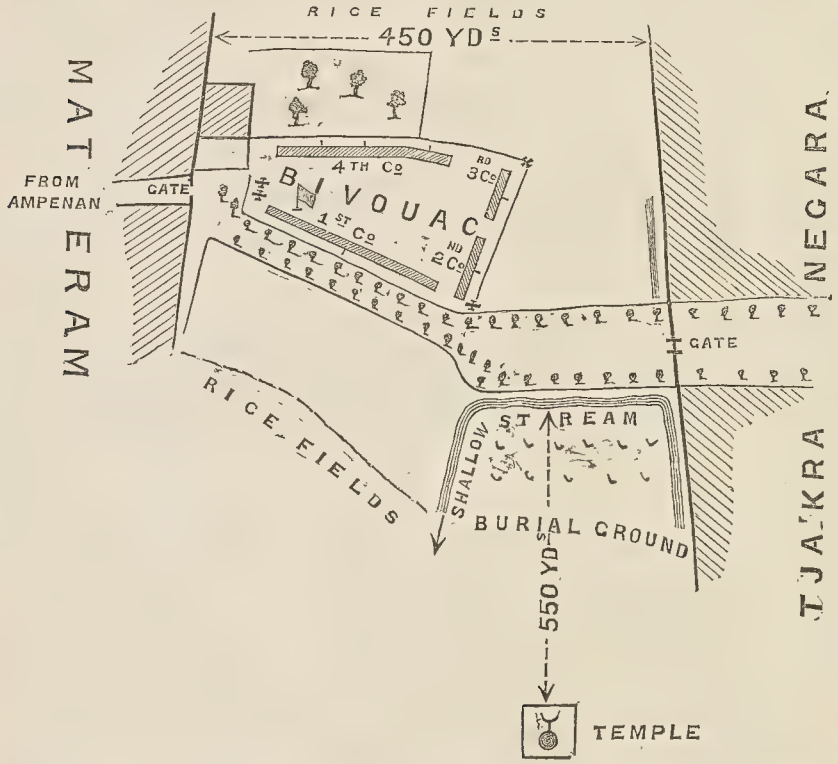
AMPENAN.

1st and 3rd companies, 9th battalion.

Remainder of half squadron of cavalry after deducting orderlies.

Night of 25th, 26th. Midnight.

Events at Tjakra Negara.—Everything was so quiet in and around the bivouac that it appeared as if the rumours were only a false alarm, when, just before midnight, a great disturbance of loud cries and beating of drums was heard in the palace and immediately after, a heavy rifle fire was brought to bear on the bivouac from the palace walls, which had been secretly loop-holed from within.



Road 50 to 100 feet wide; town walls 6 to 10 feet high and built of stone and clay.

The first to suffer were some 50 convicts in a shed under the palace wall and close to the cooking places—these men rushed shouting towards the bivouac and, being taken for the enemy, a great number of them were shot down.

The officers got their men well in hand and returned the fire from behind the walls with but little effect. An assault on the bivouac was repulsed, after which the enemy did not venture from under cover of his walls during the night, but increased his fire by placing ladders against the wall, in order to fire over it. Those firing over the wall were, however, soon driven off.

The night was dark as pitch; dawn should have commenced at 2.30 a.m., but the sky was cloudy. August 26th. 2.30 a.m.

The dispositions were somewhat as follows :—

The 4th (European) company, 6th battalion, held the open portion of the bivouac, while the 2nd Amboynese company, 6th battalion, and the 3rd Maduraese company, 7th battalion, held the low walled enclosure. Each of the two latter companies held two sections in reserve. Owing to filling up the companies of the detached columns, the sections were only some 30 strong. The force at Tjakra Negara may then be taken at 400 men.

The position soon became intolerable—officers and men were dropping fast. At 4 a.m. (26th), the dead and wounded were removed to the enclosed bivouac and the open one was abandoned. 4 a.m.

By 7 a.m. there were 16 dead and 87 wounded and heavy firing was now heard from the direction of Materam. At 1 p.m. General Vetter informed the officers that he intended to retreat. After the dead had been buried in a pit, General Vetter, with the two native companies, the Civil Staff, the wounded and the two field guns started about 3 p.m. to cut their way through to Materam, in which they eventually succeeded. The teams of the guns, however, took fright and bolted, the guns fell into the hands of the Balinese, many of the wounded in the stretchers were killed and many men lost by the fire from houses and walls. 7 a.m. 1 p.m. 3 p.m.

At about 5 p.m. the column reached the temple to the south of the road near the Materam bivouac, and where the Materam contingent had taken refuge, and took shelter there.

The 4th European company, 6th battalion, remained in the bivouac to cover the retreat and with it remained Major-General van Ham and his Staff and the Chief Staff Officer.

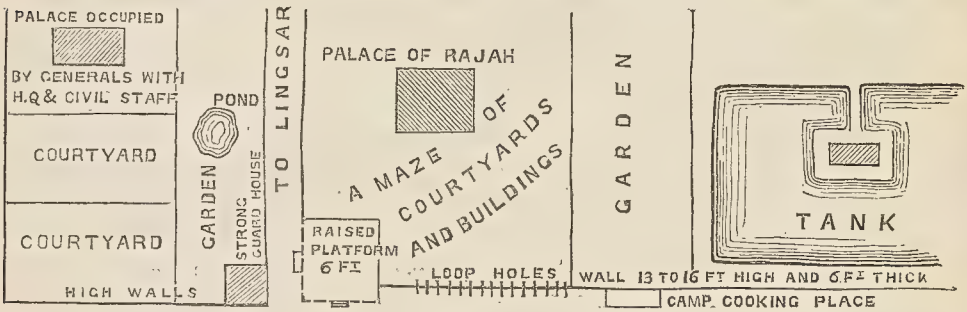
After the column had moved off, the Balinese brought such a fire to bear on the entrance to the enclosed bivouac that Captain Kamerman found it impossible to debouch. General van Ham was mortally wounded when standing outside and was carried after the column by the 4th section of the company under Lieutenant Hardie, the party numbering in all 53, including the Reverend Mr. Rogge, Protestant. Of these, only eight reached the temple at Materam, including the dying General, in whose preservation the utmost devotion had been displayed; the Reverend Mr. Rogge, distinguished for his calm attention to the wounded under the heaviest fire; and the gallant Hardie, severely wounded.

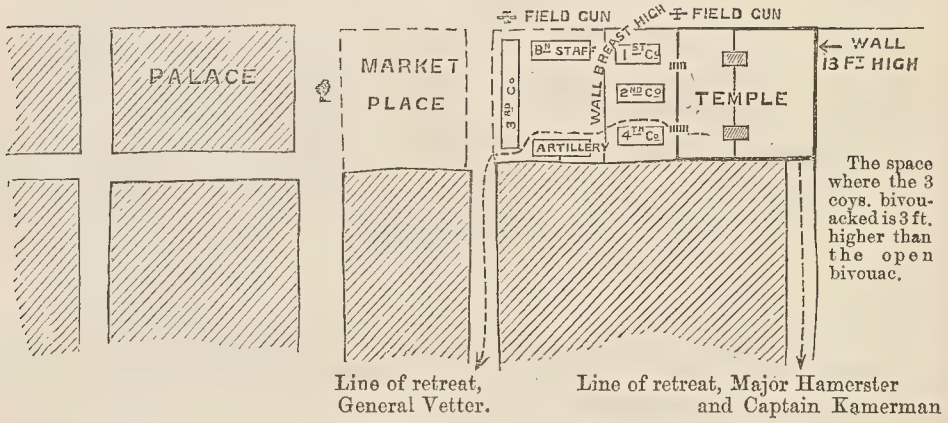
The remaining three sections of the 4th European company and the ambulance, after a fruitless endeavour to cut their way through, by the advice of Major Hamerster, the Chief Staff Officer, took refuge in the walled temple at the eastern end of the bivouac, where they entrenched themselves and where we will leave them for the present.

The whole of the stores, treasure, etc. in the bivouac fell into the hands of the enemy.

Events at Materam.—Aroused by the sound of heavy firing at Tjakra Negara, the companies of the 7th battalion occupied their alarm-posts Night of 25th, 26th, August.

—the 1st company along the great highway, the 2nd along the east





Bivouac of the 6th battalion and Mountain Artillery.

The loop-holes, field guns and lines of retreat refer to the night of the 25th and 26th August. By which time, though the 1st and 3rd companies and the 2 Mountain guns were absent on detachment, the bivouac had been reinforced by 1 company 7th battalion and 2 field guns.

August 26th. side and the 4th along the north side. The night passed away without their being disturbed. At daybreak the Commandant, Major van Blommenstein, sent out the 4th company, under Captain Yonker, to reconnoitre towards Tjakra Negara.

It had hardly debouched on to the road, however, and was about to form square, when it received a heavy rifle fire from the eastern edge of Materam, lost three killed and four wounded, and retreated, firing, into the bivouac. The enemy's fire was now directed from both Materam and Tjakra Negara upon the bivouac and the return fire could have but little effect. An assault, however, from Materam was repulsed.

2.30 p.m. At 2.30 p.m. a Council of War was held at which it was determined to abandon the bivouac and make for the temple on the south side of the road and about 700 yards off.

3.30 p.m. At 3.30 p.m. the retreat was commenced, the 4th company covering the movement. In order to make a diversion, Lieutenant Franssen, with 20 volunteers of the company, made a dash through a breach made by the guns in the walls of Materam and remained there until the retreat was complete.

All stores and equipment, including guns (rendered unserviceable), fell into the hands of the enemy, by whom many of the badly wounded were finished off.

Once in the temple, all hands set to work to make loopholes and put it into a state of defence, and this was going on when the sore bestricken column of General Vetter arrived from Tjakra Negara, about 5 p.m., to take refuge there. 5 p.m.

Shortly after, the sound of a gun and volley firing was heard in a southerly direction. This proved to be Bijlevelt's column which, at length, acknowledged the signals made and marched in about 8.30 p.m. with all its wounded and two guns. 8.30 p.m.

Lieut.-Colonel Bijlevelts column—At 1.15 a.m., on the night of the 25th, 26th August, this column received an order from the Commander-in-Chief to return to Tjakra Negara and started on its return journey at 9.15 a.m., 26th inst. No opposition was offered until approaching the Babak River. Lieut.-Colonel Bijlevelt was severely wounded and the command devolved upon Captain Creutz-Lechleitner. The passage of the river, 65 yards broad, and deep, was forced under fire and with loss. Night of 25th, 26th. August 26th.

The column then continued its advance on Tjakra Negara, on approaching, which, about 5 p.m., to communicate with the bivouac still supposed to be there, the column was received with heavy fire from the town. 5 p.m.

The guns were brought into action and the little force held its own for nearly two hours; and later with the approaching darkness, passed to its left with the intention of fighting its way to the Materam bivouac until it became aware of the signals being made from the afore-mentioned temple into which it marched about 8.30 p.m., after suffering a loss of 16 killed and 35 wounded. 7 p.m. 8.30 p.m.

We will now follow the fortunes, for a time, of the force now collected in the temple at Materam. Night of 26th, 27th.

The temple was crowded with humanity, numbering among many wounded and dying, and the night was passed in great discomfort, with much suffering from hunger and thirst.

The following morning, after burying the dead—amongst whom was Major-General van Ham—a retreat was commenced on Ampenan, avoiding the wall-enclosed high road and striking out over the rice fields to the south. August 27th.

The 7th battalion, with the wounded, led the way, then came the two mountain guns of Bijlevelt's column, then the 6th battalion (less the three sections of the 4th European company, who had not succeeded in getting out of Tjakra Negara) as rear-guard. The whole, under the executive command of Major Rost van Tonningen of the artillery. General Vetter was with the force.

Directly the column started, the enemy opened fire and fire was also received on the march from the southern side of Materam and from Sekarbela.

At length, at about 4 p.m., the exhausted column reached the bivouac 4 p.m.

at Ampenan, assisted by the 1st and 3rd companies, 9th battalion, who had been left there.

Major von Tonningen had conducted the retreat in a masterly manner.

Night of 25th, 26th, *Events at Ampenan.*—At midnight the firing at Tjakra Negara was heard and the Commandant sent out the cavalry to reconnoitre. The road to Materam was found occupied by the enemy. "The cavalry attacked, but their repeated exertions to cut their way through the enemy failed and they returned to Ampenan with the loss of one horse."

Many mules in the bivouac—alarmed by the firing—stampeded and were lost.

August 26th. In the early morning the senior naval officer sent ashore a landing party of 200 men with four guns.

The 26th and night of 26th, 27th passed quietly and on the morning

August 27th. of the 27th information was received by letter sent in duplicate from Major van Tonningen of the state of affairs at the temple at Materam.

Further naval reinforcements were asked for and 25 more men were sent ashore.

7 a.m. At 7 a.m. the two companies of the 9th battalion started and were soon in contact with the enemy, who fell back before them and shortly afterwards the column, retreating from Materam, was met. The wounded were all sent on board ship.

August 28th. On the following day preparations were made for placing Ampenan in a state of defence.

Let us now return and trace the action of the remaining fragments of this most unlucky force.

August 26th. *Lieut.-Colonel van Lawick van Pabst's column.*—On the morning of August 26th this column received an order from the Commander-in-Chief, despatched on the 25th inst., recalling them and cautioning them to take all necessary measures for safety. A message sent on the 26th informing them of the surprise and ordering them to proceed to the east coast was not received. The Commandant was informed by the headman of Koepang that a heavy gun and rifle fire had been heard, but discredited the information.

The column commenced its retreat on the 26th and bivouacked for the night of the 26th, 27th at Soerabaja, about four miles west of

August 27th Batoe Klian. It resumed its march on the 27th at 6 a.m., having been previously warned by a friendly native, who had fled from Tjakra Negara at the first shots, that there was a disturbance there.

The order of march was as follows :—

The front of the advanced-guard—Europeans—under Lieutenant Musch.

Advanced-guard—half 4th company Europeans, 9th battalion, two mountain guns, remaining half 4th company, under Captain Christan, commanding the company.

Main body—one section 2nd Javanese company, 9th battalion, train, ambulance, three sections 2nd company. These last three sections also provided the rear-guard. The 2nd company was commanded by Captain Lindgreen.

Fire was first received at the passage of the River Babak and afterwards at the passage of the River Narmada near the palace of that name, but only one man and one mule were wounded.

On approaching Tjakra Negara no enemy was seen and there was no knowledge of the disaster to the bivouac. The whole column entered the town and still no natives were seen, when suddenly a tremendous rifle fire from loopholes on all sides smote the column—killing many, including the Commander, Lieut.-Colonel van Lawick van Pabst.

Communication between the 4th European company, the advanced-guard under Captain Christan and the main body, the 2nd Javanese company, under Captain Lindgreen, was completely cut. The train was lost.

Captain Christan forced his way, with his company and the two mountain guns, past the deserted bivouac of the 6th battalion. It is singular that Captain Kamerman, 4th European company, 6th battalion, still shut up in the temple there, made no attempt to join Captain Christan. The company held on to the western exit of the town and then, to avoid passing through Materam, struck north towards Goenoeng Sari, abandoning the two mountain guns by the way, having first rendered them unserviceable. The column passed between Goenoeng Sari and Rembega, struck the shore and, following it southwards, reached Ampenan about 10 p.m. A portion of the company, under Lieutenant de Tong, which had been cut off, not reaching the bivouac until 5 a.m. on the 28th, after suffering severe losses.

Captain Lindgreen, with the 2nd Javanese company, 9th battalion, completely cut off and much harassed by fire, threw himself into the nearest cover, a temple on the north side of the great high road. Here he held out for nearly four days, surrounded by the enemy, lying between dead and wounded, without sleep, food or water and reduced to the last cartridge. Finally obliged to surrender at 1 p.m., September 1st; they were conveyed as prisoners to Tjakra Negara and were not liberated until September 6th.

This surrender of Captain Lindgreen's was the subject of a very bitter correspondence in the Dutch newspapers; but, as that officer has since been decorated, it is presumed that his action is upheld by the authorities.

August 26th. The only party now left to consider is that of the three sections of the 4th European company, 6th battalion, under Captain Kamerman, which had taken refuge in the temple near the bivouac when the main body fell back at about 3 p.m. on the 26th.

During the afternoon of the 26th the firing of Van Bijlevelt's column was heard gradually approaching and then passing away. All attempts to attract attention were of no avail.

August 27th. When, on the afternoon of the 27th, Van Lawick's column reached the town, the psssing of wounded artillery and pack-horses informed the besieged of the fate that had befallen this column also. The presence of the party in the temple might have been made known by signals—for, as we have seen, the advanced-guard of the column

passed quite close by. But, seeing that this would draw the advanced-guard in front of the palace, from the loopholes in the walls of which a murderous fire was likely to be poured upon it, and that the chance of escape lay precisely in the opposite direction, Major Hamerster decided not to make the signals and the advanced-guard passed on.

Matters were approaching a crisis; the men were suffering from hunger and thirst; the air was becoming pestiferous from the smell of the corpses in the abandoned bivouac.

At 9 p.m. on the 27th, under cover of the darkness, the little troop slipped out of the temple to the south, cleared the town and then proceeded in a south-westerly direction till they struck the shore on the early morning of the 28th and were conveyed to Ampenan on ships boats.

Losses.—When things had become more settled, and after Lindgreen and his men had been liberated, the losses during this period were estimated at:—

Killed—97, of whom 9 were officers, 50 Europeans and 38 native soldiers.

Wounded—272, of whom 17 were officers, 103 Europeans and 152 native soldiers (of whom one officer, three Europeans and 5 natives died afterwards).

Missing—10 Europeans and 16 natives, which figures were afterwards reduced to five and nine respectively.

Total—395.

A very heavy loss in a force only numbering, all told, 2215 combatants, for to it, at the time of the catastrophe, must be added the whole of Lindgreen's company.[1]

The losses among the convicts and animals are not given, but must have been very heavy.

Four field and two mountain guns were lost.

Comments.

Thus ends the first period of the campaign and it is impossible to read the accounts without being struck by several points:—

1. That, although the native troops displayed good fighting qualities, yet, when there was work to be done of a more than usually dangerous character, the European companies were selected first, *e.g.*, Kamerman's company as rear-guard at Tjakra Negara and Christan's company as advanced-guard of Van Lawick's column.

2. The Dutch appear to have been but indifferently served by their cavalry:—

(*a.*) Note the position of the cavalry during the advance on Materam.

(*b.*) Cool, in explaining the selection of the bivouac ground at Tjakra Negara, says: "Unacquainted as we were with the real extent of Tjakra Negara, it seemed to Captain Willemstijn (of the General Staff) as if there was no end

[1] "As the Rajah did not have the wounded native soldiers killed, as he did the Europeans, but spared them in order to make use of them, it is probable that of the about 100 missing, at least half were still alive and in the hands of the Rajah" (Schulze).

to this long road with high walls running on either side of it." Here was a situation which cavalry could very speedily have elucidated.

(*c.*) The cavalry reconnaissance from Ampenan, on the night of the 25th, 26th August, appears to have been executed in but a half-hearted manner. "Repeated attempts to cut a way through" an enemy, if really meant, would result in a heavier loss than "*one horse.*"

(*d.*) There were four mounted orderlies and an officer of the General Staff with Van Lawick's column. Considering the known unsettled state of affairs, it would have been better if these mounted men had sought for the 6th battalion bivouac before the column entered the town.

3. Setting aside the unfavourable position of the bivouacs and the absence of entrenchment, the great mistake appears to have been the splitting up of the force into so many small bodies.

If the Materam and Tjakra Negara forces had been massed, say at the palace at Tjakra Negara, warren though it was, with the Rajah in their power, they would not only have had a better chance of defence, but could, if necessary, have extended a helping hand to the two detached columns. These columns appear to have been quite strong enough as long as they were in the open and, if they had had a solid force at Tjakra Negara to fall back upon, their detachment seems well considered.

The Second Expedition.

In order to avoid making an exaggerated statement as to the condition of the troops re-united at Ampenan, the following extract from the work of Captain Schulze is given:—

"After the column, under the command of Major Rost van Tonningen of the artillery, with which was also the Commander-in-Chief, had reached Ampenan with comparatively small loss, but in a perilous condition from hunger and exhaustion, the best possible measures were taken before night (27th August) against a surprise. The general state of affairs at Ampenan during the first night, however, gave great cause for apprehension. The state of tension of the men's nerves was such that, again and again, they fired into the darkness at nothing and created an alarm, so that there could be no question of taking the so-much-needed rest on this night.

"Although the troops fought under that murderous fire with the courage of lions and displayed a contempt of death of which Holland may well be proud, yet it is natural and evident that, finally, many men became, so-to-speak, paralysed and temporarily lost their heads, but they gradually recovered their self-control.

"If the Balinese had vigorously attacked Ampenan on this night (27th), although it would have led to a fight to the last man, their superiority in numbers and their good weapons gave them a very good chance of completing their victory.

"Fortunately they made no energetic attempts to do so and then came the 28th August and with it fresh courage."

Gradually the town was turned into an entrenched camp and the foreground cleared. The Balinese commenced to throw up earthworks on the west and south side of Materam and also entrenched themselves on the road running southwards from Materam to Sekarbela.

August 28th. On the 28th, telegraphic orders were received that the expedition was to be proceeded with and that reinforcements would be sent. Mr. Liefrinck was sent to the east coast to raise the Sassak tribes and the navy opened fire on Materam.

August 31st. On the 31st August, two companies and the still remaining section of Mountain Artillery drove the Balinese out of the foremost outworks to the west of Materam. This expedition verified the fact that the Balinese had thrown up a breastwork in front of Aroeng Aroeng, at a distance of about 1100 yards in front of the western side of Materam.

This breastwork, built of clay taken from the rice fields, was six feet six inches high, six feet six inches thick at base and one foot three inches at the top and was some 1500 yards long. It was provided with thousands of bamboo loopholes in two rows. The upper row, for men standing, sloped slightly downwards—the lower row, for men kneeling, was horizontal.

Sept. 2nd. By the 2nd September the following reinforcements had been received:—

	Combatants.			Non-Combatants.						Horses.			Mules.	Remarks.
	Officers.	Other ranks.		Officers.	Other ranks.		Servants.	Convict estabt.		Officers.	Troop.	Pack and draught.		
		Europeans.	Natives.		Europeans.	Natives.		Headmen.	Convicts.					
Staff	3[a]	...	...	...	2	...	...	...	...	...	...	...	...	
Reinforcements, 6th, 7th & 9th battalions ...	21[b]	200	300	...	...	...	...	...	...	...	...	...	...	
2nd battn., Col. Swart	18	333	256	...	...	...	...	...	194	...	...	...		2 European and 2 Amboynese companies.
Artillery—														
Staff	2	...	...	...	...	...	...	...	...	...	...	...	...	
Field Artillery ...	3	62	29	...	...	...	...	...	...	3	47	...	1	
Mountain " ...	3	35	38	...	...	...	...	...	...	1	10	...	33	
Garrison " ...	3	99	32	...	...	...	...	...	...	...	...	...	...	
Cohorn mortar det.	...	2	...	...	...	...	...	...	...	...	...	4	2	
Cavalry...	...	6	...	...	...	...	...	...	...	...	6	...	...	
Military Administration ...	...	...	...	4	...	...	...	...	...	...	...	...	...	
Medical service ...	...	...	...	5	16	12	...	...	...	..	...	...	...	
Train	...	...	...	...	4	...	...	...	...	...	...	...	...	
Engineers	2	42	...	...	...	...	...	...	...	...	...	...	...	

The above information is manifestly incomplete as regards non-combatants and horses. [a] Includes Major-General Segov, second in command, vice Van Ham (deceased). [b] Includes Lieut.-Colonel Frackers to command 6th battalion, vice Van Bijlevelt (wounded), and Lieut.-Colonel Scheuer to command 9th battalion, vice Van Lawick van Pabst (deceased).

The guns received were :—

Six 7 cm (2·756-in.) steel B.L.R. guns, field,
Four „ „ „ „ „ mountain,
Two 12 cm (4·72-in.) bronze B.L.R. guns,
Two 20 cm (7·87-in.) S.B. mortars,

and, sent out later—

Four 12 cm (4·72-in.) bronze B.L.R. guns,
Four „ „ „ M.L.R. „
Four 20 cm (7·87-in.) S.B. mortars.

Two companies of infantry and two mountain guns made a demonstration on the west side of Materam.

Colonel Scheuer, with two companies, 9th battalion, and two field guns, occupied the temple of the village of Kaleh, on the south bank of the Antjar River, with a view to enfilading the breastwork in front of Aroeng Aroeng, but were only able to bring an oblique fire to bear. Just east of Kapitan and south of the high road two 12 cm guns were put into battery to bring fire against the front of the breastwork. The village of Kapitan was occupied by the 7th battalion. Sept. 5th.

The following orders were issued to the infantry for the attack of the next day :—

"At 5.45 a.m. to-morrow the companies will be ready for an operation against Aroeng Aroeng.

"Dress—marching order, without knapsacks, but with blankets and great-coats *en bandolier*.

"One day's dry rations (biscuit and sausage or sardines) to be taken in the haversacks. Bottles to be filled with coffee or tea.

"Each company to take its own pioneer tools as well as its reserve ammunition (eight boxes, each containing 400 cartridges, each man had also 60 cartridges on his person).

"Each company to take four dhoolies.

"Each battalion will take, in addition, 30 dhoolies and also eight ammunition boxes for each company.

"Breakfast to consist of half a loaf, butter and cheese (or sausage or sardines) and coffee.

"Before starting, a dram will be served out."

The guns at Kaleh and Kapitan opened fire at 6 a.m. At the same time the 2nd battalion, Colonel Swart, with four field guns and engineers to remove obstacles, advanced against the southern wing of an Aroeng Aroeng breastwork. Sept. 6th.

This attack was supported on the right flank by the 7th battalion and the two remaining companies of the 9th battalion, together with two field guns and engineers, which force advanced between Kapitan and Kaleh. The other two companies of the 9th were at Kaleh with the two 12 cm guns.

The 6th battalion, together with the naval landing party, remained for the protection of the bivouac at Ampenan.

The artillery bombardment continued till about 10.30 a.m., by which time the 2nd battalion had reached the long breastwork, which was

found to be deserted. The temple at Aroeng Aroeng was occupied by Colonel Swart with two companies, 2nd battalion, and two field guns—the remaining troops returned to bivouac.

On the following days the position at Aroeng Aroeng was strengthened and occupied by three companies, 6th battalion, under Lieut.-Colonel Frackers—a siege battery was constructed across the road to bring fire on Materam.

Sept. 8th. At 2 p.m. on the 8th the following pieces opened fire from Aroeng Aroeng on Materam:—Two 12 cm guns brought up from Kapitan and two 20 cm mortars, besides the fire of the ships "Emma," "Tromp" and "Borneo."

Sept. 11th. Major-General Segov, with six companies and two mountain guns, made a demonstration against Rembega, which hoisted the white flag after the first shots.

Sept. 12th. Two 12 cm guns and two field guns were added to the battery at Aroeng Aroeng and a heavy fire was turned on to Pagasangan and Pasingahan, south of Materam, and Poenia, a southern suburb of it. The fire was also increased by that of two more field guns (total—four 12 cm and four 7 cm). A bridge was thrown over the Antjar at Kaleh.

Sept. 13th. Footing was gained in Pasingahan and Pagasangan. The main column, under Colonel Swart, consisting of the 2nd and 9th battalions, two mountain and two field guns, two sections of engineers, together with the necessary ambulance and train, advanced from Kaleh over the open ground to the south-east. The right flank of this column was protected by a small force, under Major van Blommenstein, of two companies of the 7th battalion, two mountain guns and a detachment of engineers, which marched by Batoe Ringgit in an easterly direction. The enemy did not expect the attack and fled eastwards, after a resistance that cost the Dutch but two killed and seven wounded, all Europeans. They retained, however, a few points in Pasingahan.

Three companies, 9th battalion, entrenched themselves at Pagasangan with two mountain guns, the remainder returned to their bivouacs.

Sept. 14th. A hundred convicts, under the protection of four companies of infantry, were sent to strengthen the position at Pagasangan.

Sept. 15th. Five companies of infantry, with two mountain guns, were sent to Sekarbela to select and protect a position for one 12 cm M.L. gun and one 20 cm mortar, the fire from which compelled the enemy, still in Pagasangan, to retire into the eastern portion thereof by the evening.

Sept. 16th. The southern portion of Pasingahan was bombarded from the Sekarbela position. Three companies, Madura Barisan Militia (four European officers, 14 native officers and 437 men—*see* p. 591), were landed.

Sept. 17th. General Vetter in person, with the 2nd, the 9th and half the 6th battalions, one troop of cavalry, four mountain guns and two sections of engineers, advanced to the assault. The attack took place on the north and west sides; the infantry, in a combined attack, advanced on a front of 870 yards, pressed on through the villages, which had a

length of about 1650 yards, rolling up the enemy and driving him out by 11 a.m. The ground was very much enclosed, so that but little use could be made of artillery fire. Loss, one killed and four wounded.

On the north-east of Pagasangan a battery was constructed to bombard Materam. It was garrisoned by two companies, 9th battalion, two field and two mountain guns, and a section of engineers.

The demolition of Pasingahan and Pagasangan was proceeded with and fire was opened against Materam. Sept. 18th.

Three 12 cm M.L. guns were placed in the battery at east Pagasangan and fire was opened at noon against Tjakra Negara, assisted by the fire from the "Borneo." Sept. 19th

The work of demolition of Pasingahan and Pagasangan was proceeded with. The battery to the north-east of the latter place was strengthened by one 12 cm B.L. gun and that battery, together with the one at Aroeng Aroeng, continued its fire on the capital, assisted by the ships. Sept. 19th-28th.

Three blockhouses, each occupied by a section of infantry, were constructed to the south of where Pasingahan and Pagasangan had once stood.

The incendiary and common shell did a fair amount of damage to *personnel*, but relatively little to the stone and clay-walled houses of the capital.

On the night of the 21st, 22nd a large magazine exploded in Tjakra Negara.

On the 27th and 28th of September Major-General Segov made demonstrations in force towards Rembega.

On the evening of the 28th the position of the troops was as follows:— Sept. 28th

East Pagasangan.—Two companies infantry, two field guns with detachments, but without teams, a detachment Garrison Artillery for three 12 cm M.L. and one 12 cm B.L. guns and one 20 cm mortar.

West Pagasangan (Moemboel).—One section of infantry and one mountain gun, (without team).

Three blockhouses.—Each one section of infantry.

Kaleh.—One company infantry and one field gun.

Aroeng Aroeng.—Two companies infantry, two field guns without teams, a detachment of Garrison Artillery for four 12 cm B.L. guns and two 20 cm mortars.

Remainder of troops at Ampenan.

Capture of Materam.

At 8 p.m. on the 28th September the troops at Ampenan received orders to hold themselves in readiness before sunrise on the following morning (29th) for the storming of Materam. Sept. 29th,

The attack was to be made in three columns.

The main column, under Lieut.-Colonel Frackers, consisting of the

6th and half the 7th battalion of infantry, a section of engineers, artillery and train, was to advance against the south-west portion of Materam, where a great breach had been made in the southern portion of the wall, and push for the great cross roads at the centre of the town, where stood the four palaces.

The right column, under Lieut.-Colonel Scheuer, consisting of the 9th battalion and two field guns, was to establish itself in the abandoned suburb of Poenia and ward off any attack from the direction of Tjakra Negara.

The left column, under Colonel Swart, consisting of three and a half companies, 2nd battalion, two field guns and a section of engineers, was to hold itself in readiness at Aroeng Aroeng to advance at the first order or signal and enter Materam on the west side.

General reserve, two companies, 7th battalion, and six mountain guns at Kaleh.

4 a.m. The original plan was to march off from Ampenan at 4 a.m., but, as
4.20 a.m. there was a delay in falling in, a start was not made until 20 minutes later.

The main body was making its way up the valley of the Stream
6.15 a.m. Antjar towards the town when, at 6.15 a.m., an Amboynese soldier in the advanced-guard let off his rifle at a Balinese and thus gave the alarm. In a very short time a heavy fire was opened from the town. The main body closed up rapidly and, pressing on, burst into the town through the breach and, by the aid of scaling ladders carried by the plucky convicts, a sharp bayonet fight ensued.

After this first success, progress was but slow. Each wall had to be broken through; each group of houses was a fortress. The sappers and the convicts particularly distinguished themselves in the work of demolition. Some of the latter were afterwards liberated by
8 a.m. the Governor-General as a reward for their gallantry. By 8 a.m. the progress was very slow, especially on the right flank where the enemy held out most obstinately and brought the right of the main column completely to a standstill.

At this point the right column, under Lieut.-Colonel Scheuer, did yeoman service. The commanding officer was a well-known character, always with a ready joke. He never carried a sword in action, but a revolver in a holster and a short light stick in his hand, which appears to have been looked upon with the same veneration as was the "Wand of Victory" carried by Gordon by the "Ever Victorious Army." The other hand was always in his pocket.

The right column then came up with a rush and made a furious onslaught on the enemy's left flank, putting him to flight and disengaging the right flank of the main force. The further advance was
10 a.m. made with regularity and by 10 a.m. the walled grounds round the palaces were reached.

The left column made a forward movement from Aroeng Aroeng and took up a position near the western entrance of Materam.

The centre and right columns had some heavy fighting round the palaces at the cross roads, but at length the two and a half battalions

carried them with a rush, the enemy flying in great confusion towards Tjakra Negara.

The left column (2nd battalion) and the reserve (2 companies, 7th battalion) arrived at the cross roads shortly afterwards.

The town, to the northward of the great main road, presented such a maze of houses, in which the enemy still lurked, that it was not considered advisable to continue the action further on this day, but rather to get a firm hold of the ground already won.

It is within the experience of British troops that it is not infrequently the most economical proceeding to build the enemy a golden bridge. To have pursued him further into the labyrinth of the town at once would have been to meet desperate men at every turn. Night brings not only counsel, but also the means of escape and gives the desperate man time to cool and get away.

The whole of the Dutch force set to work to strengthen a position and somewhat clear the foreground, both by pick and by incendiarism. The palace at the south-west angle of the cross roads and a couple of temples were put into a state of defence and a small enclosure was constructed at the western entrance to the town. The troops returned to their bivouacs at 5 p.m., leaving two and a half companies of the 6th battalion, two field and one mountain gun in Materam and a half company of the same battalion in the enclosure at the western entrance.

Losses:—

	Killed.			Wounded.			
Battalion.	6th	7th	9th	6th	7th	9th	Total.
Officers	1	...	...	2	1	1	5
Europeans ...	3	...	1	1	21	3	29
Natives	8	...	1	17	4	13	43
	12	—	2	20	26	17	77

Besides three convicts killed and several wounded.

The Balinese lost at least 300 killed, amongst others the Crown Prince, Anak Ketoet, who had been killed, or had stabbed himself, rather than leave Materam. There were many wounded, most of whom were carried off to Tjakra Negara.

The losses among the Dutch are principally attributable to the ·44 Winchester, 14-shot carbine, of which the enemy had a number.

A considerable amount of booty aud one of the field guns lost on the night of the 25th, 26th August was captured.

The Balinese stabbed a large number of their women and children before retreating—no less than 67 being found in one heap.

At 7 a.m. Major-General Segov started from Ampenan with three Sept. 30th.

and a half companies, 2nd battalion, two mountain guns, two sections of engineers and all available convicts and proceeded to demolish Materam. Owing to the nature of the walls, powder and dynamite had but little effect and the best work was done with the pick.

The entrenched position was improved and its foreground somewhat cleared.

The enemy still lurked in the northern portions of the town. At 4 p.m. two Sassaks informed the General that there was a magazine and store of arms a short distance away in the north-west portion of the town. The General sent a party of two officers, 40 Europeans and a number of convicts to clear out the store; an ambuscade had been laid near the store, into which the party fell. Before they got away they—and those sent to help them—lost in the narrow streets two officers and one European killed, one officer and nine Europeans wounded and nine Europeans missing. The bodies of the latter were found on October 5th near the magazine.

Another of the lost field guns was recovered on this day.

During the following days, all the month of October and well into November, the levelling of the city went on and, as a natural consequence, the small parties of the enemy, lurking in its recesses, gradually withdrew. By October 6th the city is stated to have been practically clear of them, but not entirely so, for predatory gangs visited the north-east portion till November 7th.

The work of destruction was carried out by the sappers, assisted by 1800 convicts and 220 horses, who turned out at 4.30 a.m. daily and worked till nightfall.

The train at this period consisted of 2400 convicts and 520 free coolies from Madura. The latter received 1s. 8d. per diem and their keep; they were mostly either old and used up, or too young for hard work—they were not of much use; the convicts were invaluable.

The Capture of Tjakra Negara.

All through the month of October the demolition of Materam was carried on and, at the same time, batteries were constructed at Karang-bedil and at a point near the eastern exit of Materam and just north of the high road. This battery was called Padjang. The battery at east Pagasangan had still continued its fire on Tjakra Negara.

By the 20th October the following guns were bombarding Tjakra Negara:—

East Pagasangan—four 12 cm guns, three M.L. and one B.L.
Karang-bedil—six 12 cm B.L. guns.
Padjang—four 12 cm B.L. guns and four 20 cm mortars.

These were assisted by the 17 cm B.L. guns of the "Borneo."

The Rajah had made up his mind that the assault would come from a southerly direction and accordingly strong abattis had been constructed facing that point.

On the 14th October great inconvenience was occasioned by the rising of the DJANKOE stream and the sweeping away of the bridge over it. The west monsoon had now burst; the roads became difficult for traffic; the preparation of the ground for the Decanville railway was much delayed and, worse than all, the troops began to suffer much from fever and stomach complaints.

On October 30th a large powder magazine in Tjakra Negara exploded. Oct. 30th.

About November 8th a letter was intercepted at sea from Goesti Djilantiek, in Bali, to his suzerain the Rajah, saying that he would shortly leave to his assistance, a promise never carried out. Nov. 8th.

On the 16th and 17th November the 5th and 11th battalions landed. Nov. 16th and 17th.

Between the 2nd September and 17th November the following reinforcements had been received :—

	Officers.		Men.	Remarks.
	Europeans.	Natives.		
5th Battalion, Major LACUELLE	18	...	575	Landed Nov. 16th.
11th Battalion, Major van der Brandeler...	18	...	575	2 European and 2 Javanese Co's.
6th Battalion	4	...	...	
7th "	4	...	...	
9th "	5	...	...	Landed Nov. 17th.
2nd "	8	...	...	
Artillery	3	...	...	
Engineers	5	...	26	
Military administration	5	...	...	
Medical service	6	...	...	
Madura Barison	4	14	437	Landed Sept. 16th.
Totals	80	14	1613	

Besides 36 free coolies and some 650 convicts.

The Madura Barisan (or militia) deserve a word of notice.

The force called out consisted of three out of the four companies of the Bangkalan (Bencoolen) district. The following is the estimate formed of them by Captain Schulze, one of the historians of the war:—

"In bivouac they are very satisfactory." . . . . "For about a couple of years they have been approximately assimilated to the regular infantry in arms, clothing and drill. They receive pay and are under a distinct code of laws.

"The N.-C.O's. and men do not live in barracks and their clothing and arms are kept in store; but they have regular trainings under the supervision of an infantry Captain. It is self-evident that, under these conditions, soldiers wherewith to make conquests are not made.

"But, for occupation of positions, escorts, convoys, as reserves, etc., they are undoubtedly useful, even in Lombok."

During the 16th and 17th the three batteries kept up an unin-

terrupted fire—throwing some 1700 shell into the place. On the 17th the "Borneo" fired 100 shell into the town.

At 3 p.m. on the 17th all commanding officers were assembled to concert a place of attack.

In order to set free the attacking party, Kapitan was garrisoned by one company Barisan, 164 men, naval landing party and one section Europeans of the 5th battalion. This latter battalion also took over the three blockhouses and other posts.

This left for the assault:—

The 2nd, 6th, 7th, 9th and 11th battalions.
One company of Barisan.
Sixty men, naval landing party.
A detachment of cavalry as orderlies.
Four field guns.
Four mountain guns.
Four Cohorn mortars.
Three sections engineers.
Three divisions of the general train.

Nov. 18th. The troops from Ampenan and Kapitan moved off at 3.30 a.m. for the rendezvous. The whole force was divided into three columns and a reserve:—

C.O.	Left or Northern Column	Centre Column	Right or Southern Column
	Major-General Segov	Colonel Swart	Colonel Scheuer
Infantry	6th Battalion 1st & 2nd Co.'s 11th battn.	2nd Battalion	9th Battalion 3rd & 4th Co's. 11th battn.
Artillery	2 Mountain guns	2 Cohorn mortars	2 Cohorn mortars
Engineers	1 Section engineers	1 Sectn. engineers	1 Section engineers
Hand grenades ...	3 Gunners with hand grenades...	3 Gunners with hand grenades...	3 Gunners with hand grenades
Cavalry ...	6 Cavalry orderlies	4 Cavalry orderlies	4 Cavalry orderlies
Train ...	125 Convicts with tools ...	125 Convicts with tools ...	125 Convicts with tools

Reserve.—Major Willems, 7th battalion, one company Barisan, 60 men, naval landing party, four field guns, two mountain guns and 75 convicts.

The Commander-in-Chief, with his Staff, was with the reserve.
Central ambulance near the siege battery at Padjang.
Altogether some 3500 combatants with 450 convicts.

The three columns were to advance at 5.30 a.m., the objective of all three being the palace.

The right column was to advance south of, and with its left touching the great high road, on a front extending as far as the first parallel road to the south of the main road and, in order to secure its right flank, it had been made stronger than the centre column.

The centre column was to advance from Padjang, between the Antjar stream and the main road.

The right column was to advance from Mondjok, with its right on

the Antjar stream, to occupy the enemy and cut off his retreat towards the mountains in this direction and to prevent reinforcements being sent to him from the villages to the north.

All three columns were provided with scaling ladders carried by convicts.

The reserve was to advance along the great highway, following the movements of the centre and right columns.

At about 5 a.m the right and centre columns arrived opposite their points of attack and advanced some 200 yards into the town without attracting attention. 5 a.m.

At about 5.30 a.m. the northern column was received with heavy fire, under which it stormed the town wall. It appears that, owing to the heavy bombardment of the two preceding days, the enemy had withdrawn to the northern portion of the town, which accounts for the immunity with which the other two columns had hitherto advanced. 5.30 a.m.

The left column encountered severe resistance and it was not until it received the support of two companies of the reserve that the advance could be continued.

The centre column was not fired upon till it reached a point some 1100 yards from the centre of the town at 8.30 a.m., and at 9 a.m. reached and occupied the palace at the north-west corners of the cross roads at the centre of the town, the former quarters of General Vetter. They received a heavy fire from the palace at the south-west corner. This palace was soon rushed and then footing was gained in the main or north-west palace by about 11 a.m. 8.30 a.m. 9 a.m. 11 a.m.

The right column had penetrated to the road running north and south through the centre of the town by a roundabout way. They then moved northwards, when, at 7 a.m., they received a heavy fire, which caused them to abandon the road, to advance slowly on either side of it and at length arrived at the cross roads, where they arrived about noon, by which time the centre column had carried most of the main palace. 7 a.m. 12 noon.

Some little time later the left column arrived and took part in the attack on the still unconquered portion of the palace, the defence of which was of a house to house character and most stubborn.

On account of the exhaustion of the troops, it was determined not to storm the redoubt of the palace on this day, so two defensive positions were taken up over against the palace and occupied by seven companies of infantry, two guns and two sections of engineers. The other troops returned to bivouac about 6 p.m. 6 p.m

Losses.—

	Killed or Died of Wounds.	Wounded.
Officers	5	3
Europeans	24	63
Natives	13	37
Convicts	8	9
Totals	50	112

The losses of Balinese had been extremely heavy and among them were many women. These Hindoo women, some of them ladies of high rank and daughters of the Rajah, had been told that, if captured, they would be handed over to the troops. Rather than face which indignity, many of them led most desperate lance charges made by members of their own sex. Many other women and girls either stabbed themselves or were stabbed by their own people rather than fall into the hands of the troops.

Nov. 19th. The night of the 18th—19th passed quietly and on the troops arriving from Ampenan it was found that the palace had been entirely abandoned.

Enormous booty in gold and jewels, said to be worth some millions of pounds, fell into the hands of the Dutch. The town was thoroughly reconnoitred and the inhabitants were ordered to throw down the walls surrounding their houses, an order with which they immediately complied. They also gave up, of their own accord, two field and one mountain gun that had been lost in August; the last missing mountain gun was brought back later. Large numbers of B.L. and repeating rifles were surrendered. The Rajah had fled to Sassari, a village or suburb at the north-east corner of the town. A magazine exploded in the palace, killing several convicts who were emptying it.

Nov. 20th. Four battalions of infantry, four mountain and two field guns, with detachments of cavalry and engineers, marched to Sassari and captured the old Rajah and many members of his family without resistance.

The remaining history of the campaign may be dismissed in a few words. The next few days were occupied by sending out flying-columns to capture various members of the royal family still at large. Resistance was encountered in some cases and on the 22nd Lieut.-Colonel Frackers and one native soldier were killed and one officer and 12 men wounded on one of these expeditions.

On November 23rd the Rajah and many members of his family were deported to Batavia.

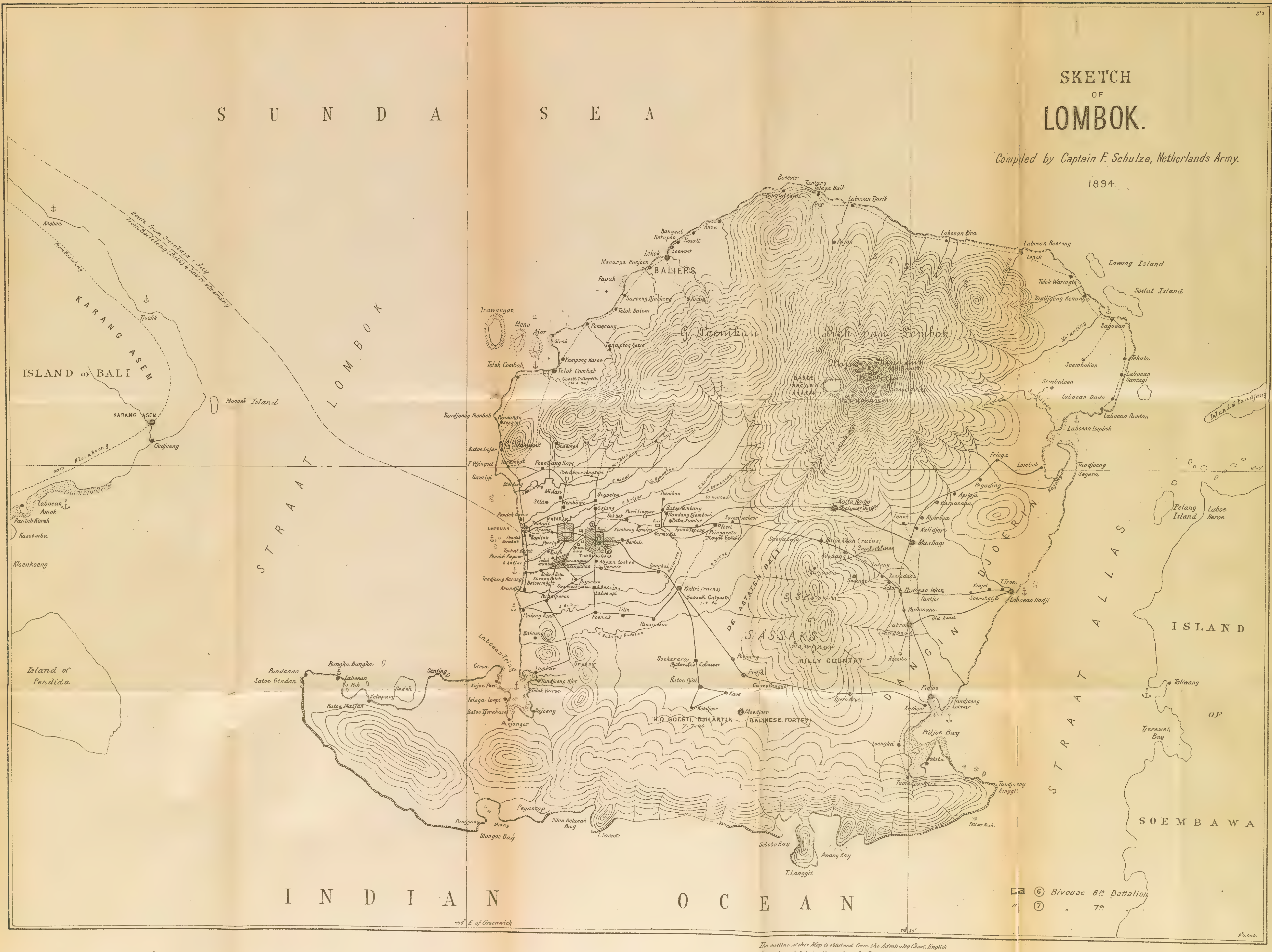
The Balinese being now completely broken, it was found no longer possible to carry out the original intention of the Dutch-Indian Government to put a relative of the Rajah on the throne, while securing guarantees for the safety and self-government of the Sassaks. Besides, the treachery of August demanded severe punishment. The island is now under Dutch rule.

The total losses of the Dutch during the campaign were :—

	Officers.	N.-C.O's. and Men. Europeans.	N.-C.O's. and Men. Natives.	Totals.
Killed	15	96	64	= 175
Died of wounds	5	20	19	= 44
Wounded	25	218	216	= 459
Died in hospital	...	175	71	= 246
	45	509	370	= 924

Besides a number of convicts.

SKETCH
OF
LOMBOK.



English Miles 10 5 0 10 20 30 40 English Miles $\frac{1}{320,000}$

The outline of this Map is obtained from the Admiralty Chart. English
It is enlarged to twice the scale of the English Map.
English scale ·114 inches – 1 nautical mile – $\frac{1}{640,000}$
Scale for this Map – $\frac{1}{320,000}$ 10 miles = 1·98 inches
S. – Sorngi or Stream

Nov.

Nov.

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STATISTICS OF THE SIEGE OF SEBASTOPOL.

COMMUNICATED BY

THE SECRETARY.

The following tables were compiled by the late Lieut.-General G. T. Field, R.A. while serving in the Crimea and sent home to his brother the late Canon T. Field. The following letter accompanied them :—

Crimea, 14th Jan., 56.

'My Dear Tom,—As a supplement to my letter to-day, I enclose you a series of tables we have compiled from the various statistics of the Siege of Sebastopol. These are of considerable professional interest, though perhaps, too technical to be valuable to you. However, both James (who is a collector of figures) and yourself may like to look over them.

One stipulation to be made is that they are not to be published *nor copied* except "by authority"—I only mention this as a caution—though doubtless unnecessary with you. The fact is some people are so fond of putting things into the newspapers, that on professional matters we are obliged to be guarded, till the authority is given, and as this is a copy of an official return I, of course, am answerable for its safe custody at present. Hereafter, I doubt not some Napier will arise to elucidate the history of this war, then, all that is of interest in this and such like matters will be brought before an enquiring public. I wish I had the *power* and the time of a Napier to be the historian. I despair of getting the log of the Pet or the Frasers, but *hope* to come across them before fresh campaigns damp the interest.

Your affectionate brother,

Geo. T. Field.

The 'Pet' to which reference is made was a small cutter yacht fitted out by the late Canon Field and a friend and by them taken to the Baltic where they witnessed the operations of the British fleet,

describing their adventures in a book called "The log of the Pet." The other reference cannot be traced. The tables have been placed at the disposal of the R.A.I. by Lieutenant C. R. B. Owen, R.A.

TABLE I.—Armament of the English batteries at commencement of each bombardment. Showing number of pieces of ordnance manned by Royal Artillery and Royal Navy.

Date.	ARMAMENT.													
	Mortars.				Guns.									
	13-Inch.	10-Inch.	8-Inch.	5½-Inch.	Lancaster.	24-Prs.	32-Prs.	8-Inch.	10-Inch.	68-Prs.	9-Prs.	Totals.	Manned by Royal Art y.	Manned by Royal Navy.	Totals.
17th October 1854	...	10	...	...	4	30	7	16	...	5	...	72	...	...	...
9th April 1855	20	16	...	...	...	20	42	15	4	6	...	123	74	49	123
6th June 1855...	27	17	...	...	...	...	49	46	8	8	...	154	98	56	154
17th June 1855...	30	17	8	...	...	...	49	46	8	8	...	166	115	51	166
17th June 1855...	33	24	7	20	1	...	53	46	8	4	...	196	141	55	196
6th September 1855 ...	34	27	10	20	2	...	61	37	7	6	3	207	158	49	207

TABLE II.—Showing the casualties which occurred during the Siege amongst officers, N.C.O.'s and men :—

OFFICERS.						N.C.O.'s AND MEN.			
Killed.			Wounded.						
Date.	No.	Names.	Date.	No.	Names.	Date.	Killed.	Wounded.	Totals.
1854.			1854.						
Oct. 21. ...	1	Capt. Childers	Oct. 23 ...	1	Major Young	Oct. ...	12	84	96
			Oct. 24 ...	2	Capt. Moubray	Nov. ...	3	13	16
1855.			Oct. 24 ...	3	Lieut. Hope	Dec. ...	...	1	1
April 12. ...	2	Lieut. Luce							
April 12 ...	3	" Mitchell	1855.						
July 6. ...	4	Capt. Gordon	April 10 ...	4	Lieut. Sinclair	Jan. ...	...	...	...
Aug. 17. ...	5	" Oldfield	April 13 ...	5	Lieut. L'Estrange	Feb. ...	...	...	...
Sept. 6. ...	6	" Snow	April 14 ...	6	As.-Surg.-Cockerell	Mar. ...	1	3	4
Sept. 8. ...	7	" Fitzroy	June 6 ...	7	Capt. M. Adye	Apl. ...	22	83	105
	8	Dy-Ast. Com. Hayter	June 9 ...	8	Lieut. Conolly	May ...	...	7	7
			June 7 ...	9	Lieut. Keene	June ...	28	111	139
			June 6 ...	10	Capt. Gordon	July ...	5	11	16
			June 17 ...	11	Capt. Arbuthnot	Aug. ...	9	82	91
			June 17 ...	12	Lieut. Tillard	Sept. ...	10	57	67
			June 18 ...	13	Capt. Williams				
			Aug. 9 ...	14	Lieut. Scott				
			Aug. 20 ...	15	Capt. P. Dickson				
			Aug. 23 ...	16	Lieut. de Winton				
			Aug. 26 ...	17	Capt. Arbuthnot				
			Aug. 17 ...	18	Major Henry				
			Sept. 1 ...	19	Lieut. Price				
			Sept. 2 ...	20	Lieut. Roberts				
			Sept. 8 ...	21	Lieut. Tyler				
			Sept. 8 ...	22	Lieut. Champion.	Totals ...	90	452	542

TABLE III.—Showing the issues of ammunition during the Siege :—

	MORTARS.				GUNS.																				
						24-Pr.		32-Pr.					8-Inch.					10-Inch.		68-Pr.		9-Pr.			
	13-Inch.	10-Inch.	8-Inch.	5½-Inch.	Lancaster.	Solid shot.	Common shell.	Solid shot.	Common shell.	Shrapnel shell.	Common case.	Grape.	Hollow shot.	Common shell.	Shrapnel shell.	Common case.	Grape.	Hollow shot.	Common shell.	Solid shot.	Common shell.	Solid shot.	Common shell.	Shrapnel shell.	Totals.
Total Issued...	40723	38704	4432	7816	1833	33490	596	77146	9319	2903	1176	557	39693	23348	1149	1669	56	4687	2536	8327	...	462	150	120	300,892
Remaining in batteries, &c.	1387	1361	1258	2969	291	5424	158	22506	1143	334	1173	69	3870	3298	507	880	29	975	137	1606	...	37	...	13	49425
Total expended	39336	37343	3174	1542	1542	28066	438	54640	8176	2569	3	488	35823	20050	642	789	27	3712	2399	6721	...	425	150	107	251,872
Light balls and carcasses, ...	...	...	...	..	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	405
																									251,872

TABLE IIIA.—Showing the weight of powder, shot and shells expended and of guns in use during the Siege :—

	Total Weight.			
	Tons.	Cwts.	Qrs.	Lbs.
Weight of powder expended	1239	3	3	26
" shot and shells expended	9053	14	1	9
" guns in use during the Siege...	...	...	...	...

TABLE IV.—Showing the number of guns in use during the Siege and those which were destroyed, burst and became unserviceable :—

	Mortars.				Guns.							Remarks.
	13-Inch.	10-Inch.	8-Inch.	5½-Inch.	Lancaster.	24-Pr.	32-Pr.	8-Inch.	10-Inch.	68-Pr.	9-Pr. (brass)	
Destroyed or rendered unserviceable by the enemy's fire	1	1	...	...	...	25	32	25	2	1	...	*4 sea service 13-in. mortars included. †21 32-prs. lent to the French included.
Burst by the enemy's fire	...	...	...	...	...	...	...	...	...	1	...	
Burst by accident...	1	2	...	...	3	2	1	...	...	1	1	
Rendered unserviceable by use...	3	4	...	...	1	27	75	36	1	...	...	
Guns lent to the French. Burst by accident	...	...	...	...	...	...	1	...	...	1	...	
Guns lent to the French. Unserviceable by use ...	...	...	...	...	...	...	20	...	...	1	...	
Total destroyed and unserviceable	5	7	...	...	4	54	129	61	3	5	1	
Remaining available	34	28	10	20	4	3	32	15	7	2	2	
	39*	35	10	20	8	57	161†	76	10	7	3	

TABLE IVA.—Detail of ordnance which burst during the Siege in the English batteries as shown in Table IV. :—

Date.	Mortars.				Guns.							Totals.	Remarks.
	13-Inch.	10-Inch.	8-Inch.	5½-Inch.	Lancaster.	24-Pr.	32-Pr.	8-Inch.	10-Inch.	68-Pr.	9-Pr.		
18th October 1854	...	...	...	...	1	...	...	...	...	...	...	1	*By a Russian shell exploding in the muzzle. †By firing at a high elevation.
23rd October 1854	...	...	...	...	1	1	...	...	...	...	...	2	
28th October 1854	...	...	...	...	1	...	...	...	...	...	...	1	
11th November 1854	...	...	...	...	...	1	...	...	...	...	...	1	
8th December 1854	...	...	...	...	...	...	...	...	...	...	...	...	
11th April 1855	1	...	...	...	...	...	...	...	...	1*	...	2	
June 1855	...	...	...	...	...	...	...	...	1	...	...	1	
4th July 1855	...	...	...	...	...	...	...	...	...	1†	...	1	
9th August 1855	...	1	...	...	...	...	...	...	...	...	...	1	
September 1855	...	...	...	...	...	...	1	...	...	...	...	1	
Date not known	...	1	...	...	...	...	...	...	...	...	...	1	
	1	2	...	...	3	2	1	...	1	2	...	12	

TABLE V.—Showing the periods at which different pieces of ordnance became unserviceable :—

Date.	Mortars.				Guns.						
	13-Inch.	10-Inch.	8-Inch.	5⅘-Inch.	Lancaster.	24-Pr.	32-Pr.	8-Inch.	10-Inch.	68-Pr.	9-Pr.
October 1854	...	...	...	...	...	5	2	11	...	1	...
November 1854	...	...	...	...	...	10	2	3	...	...	...
December 1854	...	...	...	...	...	...	...	1	...	1	...
January 1855	...	...	...	...	...	...	...	...	...	...	...
February 1855	...	...	...	...	...	...	...	...	...	...	...
March 1855	...	...	...	...	...	...	1	...	...	...	...
April 1855	4	...	...	...	...	10	10	1	...	...	1
May 1855	...	...	...	...	...	...	...	...	...	...	...
June 1855	1	1	...	...	...	...	2	3	1	1	...
July 1855	...	...	...	...	...	...	1	1	...	...	...
August 1855	...	3	...	...	...	...	12	5	1	...	...
September 1855	...	...	...	...	...	...	2	...	...	...	...
Totals	5	4	...	...	...	25	32	25	2	3	1

TABLE VI.—Showing the expenditure of ammunition during the different bombardments and at other periods :—

Date.	ARMAMENT.											Light Balls.	Carcasses.	Totals.
	Mortars.				Guns.									
	13-Inch.	10-Inch.	8-Inch.	5⅘-Inch.	Lancasters.	24-Prs.	32-Prs.	8-Inch.	10-Inch.	68-Prs.	9-Prs.			
17th Oct. to Nov. 1854	...	2745	...	...	370	7112	5711	5943	...	...	...	...	...	21881
9th April to April 1855...	5519	4922	...	...	...	8679	5539	1604	640	3730	...	...	...	30633
6th June to June 1855	8271	5543	...	...	...	...	5627	12300	1142	...	...	...	...	32883
17th June to June 1855	2286	884	...	...	...	...	9746	6712	1706	1350	...	...	...	22684
17th Aug. to Aug. 1855	5976	5267	...	906	...	...	6984	6500	492	145	...	...	...	26270
5th Sept. to 8th Sept. 1855 ...	6677	4860	870	314	...	...	9894	4111	254	1496	...	...	...	28476
At other periods ...	10607	13122	2304	3627	1172	12713	22375	20161	1877	...	682	...	...	88640
Carcasses and light balls ...	...	...	...	...	...	...	...	...	...	...	...	300	105	405
Totals	39336	37343	3174	4847	1542	28504	68876	57331	6111	6721	682	300	105	251872

INDEX—VOL. XXIII.

PRÉCIS

AND

TRANSLATION.

THE OPERATIONS OF WELLINGTON AND SOULT IN 1809 AND 1812.

BY

THE LATE MAJOR VON ROESSLER OF THE GERMAN GENERAL STAFF.

TRANSLATED BY

MAJOR E. S. MAY, R.A.

THIS paper was to have been read before the Military Society of Berlin on the 15th of November, 1893, but the untimely death of the author—a most gifted man—before that date prevented its ever being heard.

It has been published however in the supplement to the *Militär Wochenblatt* for 1894 by Colonel von Lezczynski, and is now offered to English readers in the hope that it may interest them as being a foreign estimate of the great duke's strategy.

E. S. M.

16th September, 1895.

Rich even to repletion in stirring and dramatic situations as is the Peninsular war, it is the great strategic operations which are nevertheless the most interesting, and it is concerning them that we also possess the most complete information.

The generals who took part in the great struggle have either themselves written memoirs dealing with their experiences in it, as in the case of King Joseph Buonaparte, Suchet, Jourdon, and Marmont, or we possess biographies of them compiled from the most reliable sources, as in the case of Brialmont's great work on Wellington. Finally the correspondence of the first Napoleon, published under the auspices of Napoleon III., furnishes us with an almost inexhaustable fund of information on the subject. We are thus enabled to follow the operations, campaign by campaign, from the point of view of both head-quarters, we can weigh them impartially, and can pronounce an unprejudiced judgment. The study of the tactical incidents of the war is on the other hand found to be coloured by the personal feelings of the individual officers who have devoted

attention to the matter. It is to be regretted that the French General Staff has not yet seen its way to give us an account of the wars of Napoleon based on the original documents stored away in the archives of the War Office. When this is done, a most valuable addition will be made to our military knowledge.

Thus it comes about, as we have said, that the large strategic operations in this war presents special attractions to the student, and none of them will prove more interesting (if we except Napoleon's compaign in the winter of 1808–09, and Massena's advance against the lines of Torres Vedras) than the four offensive campaigns which the English undertook. The first and last of these, the most skilfully conducted as far as strategy is concerned, were directed against the Bayonne—Burgos Road, the narrow channel through which flowed the stream of supply that fed the French armies, and the most vital point at which the invaders might be struck. The goal, on the other hand, which Wellington had in view during his second and third campaigns—those which we propose now to discuss —was Madrid, the capital of his opponent's country; and in them his enterprise was foiled in both instances by the inventive mind of Soult.

When the Spanish standing army had been shattered, and the new government firmly established, Napoleon returned to France. This was at the end of January 1809, and the forces he left in the Peninsula stood at that time divided into four groups. To the Eastern army was assigned the subjugation of Arragon and Catalonia, and, on that task being accomplished, the conquest of the kingdom of Valencia. A Northern army was to overawe the provinces of Gallicia and Asturias, which had already been occupied. The operations of these two armies, even if not of a precisely similar nature, were nevertheless of only secondary importance, and we may at present leave them outside the sphere of our considerations. As regards the two other armies, that of the South, under Marshal Victor, lay at Almaraz on the Tagus, while the Western one, under Marshal Soult, was posted at Santiago, on the northern boundary of Portugal.

On the side of their opponents the opposition government of Spain had established itself afresh at Seville, and was engaged in organizing the fighting strength of the Southern provinces for further resistance. Meanwhile, however vast the devotion and self sacrifice might prove to which patriotism could nerve the Spanish people, months must necessarily elapse ere the new organizations, which it was intended to create, could be led into the field in anything like a state of military efficiency. Moreover the recent victorious campaign of Napoleon had very powerfully impressed the government, parliament, and people of England. Men could not altogether put away the idea that it would be wiser to call home the British army which held Lisbon, and leave the Peninsula to its fate. Even at the beginning of March the government called the special attention of Wellington to this project. The directions which Napoleon left behind him were intended to deal with this state of things.

For the armies of the West and of the South the following objectives were indicated. Both were to operate at the same moment against the centres of hostile resistance, and were to march for Lisbon and Seville respectively in the middle of February. It was calculated that the desired marches would be accomplished at the end of March, and that then the two armies would be in communication with one another *viâ* Badajoz.

The principal line of operations therefore for the Western army, Soult's, which consisted of four infantry and two cavalry divisions, and according to the somewhat exaggerated estimate of the Emperor, had a strength of 36,000 men, was the road Santiago, Oporto, Coimbra, Lisbon, running along the sea coast. The distance it had to traverse was, as the crow flies, 65 miles,[1] or thirty easy days' marches. If we throw in ten days for rest it will be seen that the time, from the

[1] A German mile equals 3·89 English ones.


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Coruña
rpiguay
Santiago
Galicia
Miño
Vigo
Braga
Oporto
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Abrant
Torres
Vedras
Lisbon
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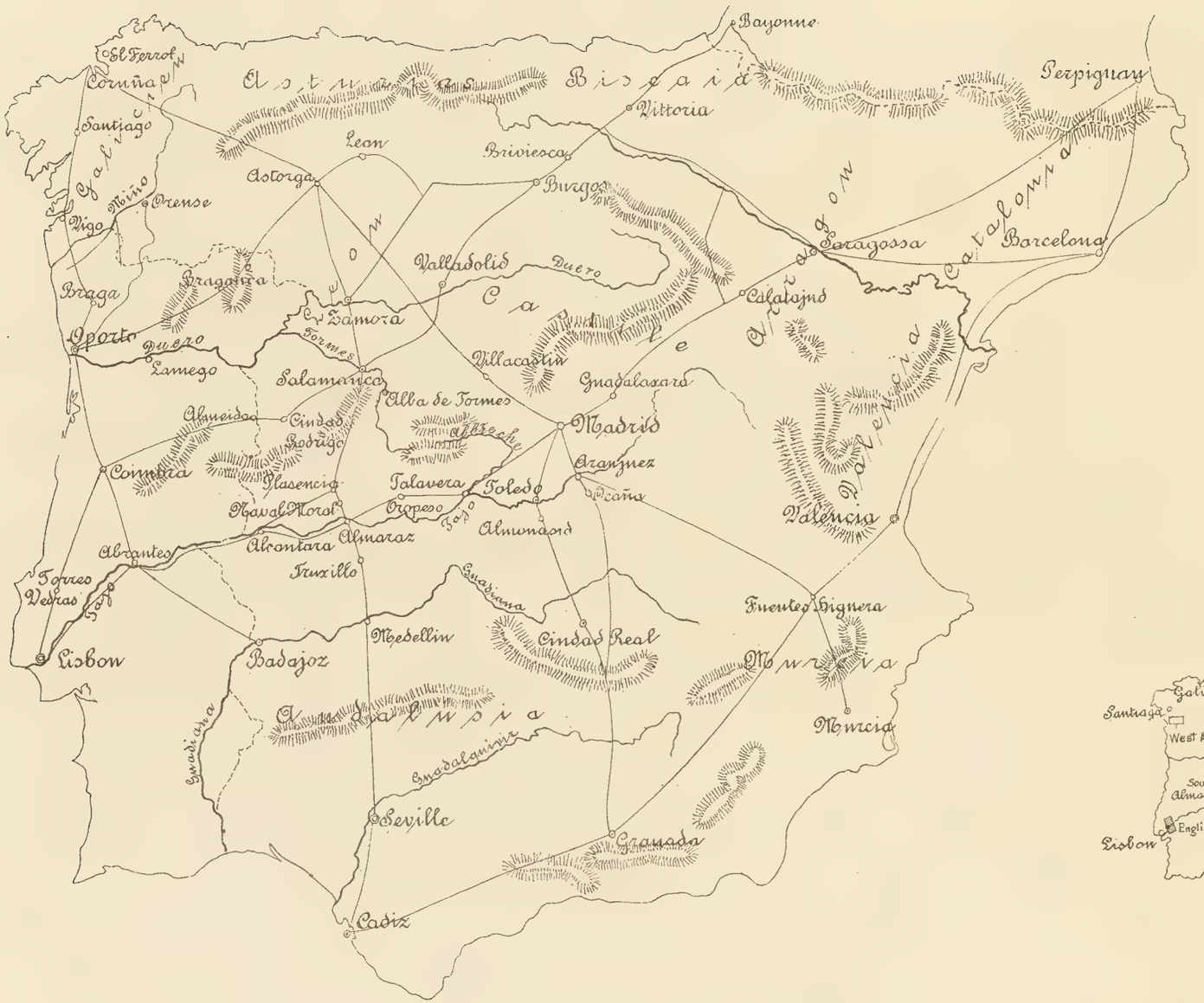
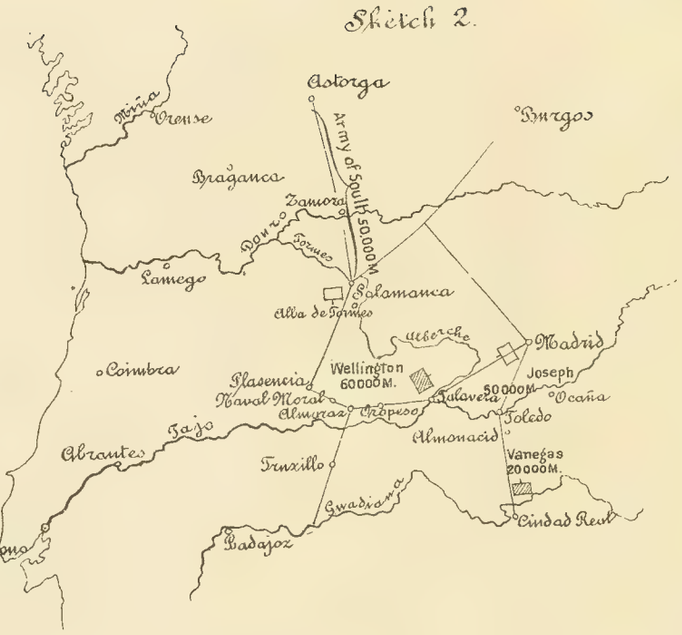


Sketch 2.



Sketch 1.

Sketch 3.

THORN WOOLWICH

middle of February to the end of March, allowed for the operation was ample. No hostile resistance was anticipated. The enemy had indeed no army in the field; and the most that was expected was that the English army might be met with at Lisbon, if indeed the islanders still ventured to try and establish themselves in Portugal. In accordance with these instructions, Soult's army began its forward movement on the 15th of February, but almost immediately began to encounter considerable obstacles due to the incredibly bad state of the roads and the growing hostility of the population.

Thus it was found that the Portuguese had destroyed all the bridges over the lower Minho. In order to get across the river, therefore Soult, who with characteristic carelessness had marched without a pontoon train, had to move for 15 miles up one bank, and again 15 miles down the other. In other words he had to go some 30 miles out of his way. When at length his army had, after this expedition, reached the direct road, and was moving to the attack of Oporto with the object of there securing a passage across the Douro, it was met by the news that the town had been entrenched and was garrisoned by a strong Portuguese force. By the exertions of the clergy a considerable army of militia had indeed been got together, and the Bishop of Oporto placed himself at its head. Soult without hesitation determined to attack, and on the 29th of March gained an easy victory over his more or less untrained opponents. In vain did the Portuguese fight with the most praiseworthy courage. In vain did the fighting Bishop, clad in all his vestments, lead the fanatical peasants to the onset—a drawn sword in one hand and a crucifix in the other. The determined bayonet charge of the French battalion columns at the first rush completely routed the undisciplined mob before them. The battle ended after a few hours fighting in the capture of the entrenchments, the dispersion of the Portuguese army, and the occupation of the town.

French accounts give the Portuguese strength at 60,000 men, and place their loss at from 8000 to 9000 men, and 200 guns, while they do not admit on their side more than between 300 and 400 *hors de combat*. These estimates, as far at least as the Portuguese are concerned, are probably exaggerated, but it has not been found possible to verify them by Portuguese returns.

The immediate result of this victory was the subjugation of the north of Portugal, but so many detachments had to be sent away from the French army to hold the country and preserve the communication with the rear, that Soult was compelled at once to call a halt.

Meanwhile the Southern army, which was to co-operate with him, had been similarly involved in endless combats with the Spanish militia; it had however at length reached Medellin on the Guadiana, and had endeavoured to obtain news as to the whereabouts of the army of the west, with the object of establishing the desired communication with it by way of Badajoz. Its efforts however in this direction were practically fruitless, and therefore this army too, in place of marching to the Guadalquiver, came to a standstill, and remained for two months halted on the Guadiana. During the whole of this period the guerrillas had so completely interrupted communications between the armies of Ney and Soult with France, Madrid, and the army of the South, that the French leaders were forced to seek news of what was going on from the doubtful channel of smuggled English newspapers. These made the situation of Napoleon, on the banks of the Danube—they were the days of Regensburg—appear by no means satisfactory.

In spite of the victory he had gained, Marshal Soult had therefore failed to carry out the project assigned to him. At the end of March, when he should have been in front of Lisbon, he was still only at Oporto. He now determined to still further neglect his instructions, and to wait ere he pressed on towards Lisbon until he had secured a safe base of operations for himself in the north

of Portugal. For this purpose he deemed it necessary and possible, in the first place, to gain the goodwill of the Portuguese. The population of the towns, especially so in the case of the wealthy commercial city of Oporto, was half composed of Jews, who, by reason of their wealth and industry, had acquired a preponderating influence amongst their fellow citizens, and these men regarded Englishmen, with their commercial tendencies, in the light of natural rivals. The Marshal therefore now began to look closely into the administration of the country with a view to the protection of local interests; he tried to introduce order and security into business matters; and sought to establish cordial relations between his soldiers and the inhabitants of the country. Accordingly at this time one of those extraordinary developments in which the Peninsular war is so rich began to show itself. The French army took to political intrigue. And three principal parties grew gradually into existence both among officers and men. The first, and the Marshal and his staff can scarcely be described as hostile to it, wanted to turn North Portugal into an independant state, and would have crowned Soult himself King of North Lusitania. The second faction regarded such objects as damnable treason against the Emperor, and was prepared to resist them by every means in its power. Its members were even determined to rise in open revolt and arrest and imprison the Marshal rather than let him stretch out a hand towards a kingly crown. Yet a third party, and one more numerous too than either of the others, consisted principally of men secretly of royalistic sympathies, and was ready to go further even than the first. Its members were ready also to break into mutiny, but theirs would be revolt not so much against Soult as against the Emperor. What they had in view was to enter into an alliance with the English, to join their army on its march to France, there to oust Napoleon from the throne, and once more establish the dynasty of the Bourbons in his place. It was this party which sent an agent, Captain Argenton by name, to Lisbon, where he was to see Wellington and open up negotiations with him.

While all this was going on the war party had gained an ascendancy in England, where, as we have said, the government had been on the very point of leaving the Peninsula altogether; and had succeeded in getting Wellington entrusted with the chief command.

"The Lord" [1] landed on the 22nd of April at Lisbon and received the agent a few days later. One can imagine the astonishment of the British general when the French officer unfolded his project to him. Such a wild scheme scarcely commended itself to the sober, prudent, and practical minded Wellesley, and he regarded it as too fanciful an one for him to enter into. But it showed him the possibility of accounting for Soult's army divided, as he now saw it was, by strifes and factions. Should he succeed in doing so, the offensive movement he had in view against Madrid would be prepared for in the best possible way, as the English army would then have no anxiety as to the safety of its left wing. Wellesley therefore made a show of entertaining the overtures of the agent, moved his head-quarters to Coimbra, and collected there an English and Portuguese army of some 30,000 men.

On his way back from Coimbra to Oporto Captain Argenton stumbled on the outposts of General Lefebure-Desnouettes to the south of the Douro. He had formerly served under the command of this officer and was beholden to him for some acts of kindness. The General was totally unaware of the proximity of the English army and of the danger which threatened him. Both in order to save him, and also if possible to draw him into the conspiracy which was being

[1] This term of the author's sounds oddly. As readers of the Swabey Diary may have noticed, Wellington was nicknamed "the peer" during the Peninsular War, but not, I think, till later, for he was not raised to the peerage until after Talavera.—E.S.M.

hatched, Argenton laid bare to him the secret schemes, and announced the advance of the English. Lefebure felt it his duty to tell Soult of what had occurred, who at once placed the Captain in arrest, and ordered him to be tried. The case was heard on the 2nd of May. The statements made by the traitor, not only opened the eyes of the Marshal as to the situation in which he was placed, but showed him clearly what the state of feeling was amongst his troops. He saw plainly that a rapid retreat could alone save him from being crushed by the superior forces of his opponent.

Two roads were open to him for such a retreat. The one led by Braga to Vigo, the other by Braganza to Leon. The Marshal elected to take the latter, and on the 12th of May his army was echelonned along that road ready to move off, leaving a rear-guard still in possession of Oporto. But these four days had given Wellesley time first of all to send a strong detachment across the Douro at Lamego, and thus to block the road at Braganza, and then on the 12th of May to fall with his main body on the French rear-guard in Oporto, to force it out of the town, and to seize the road to Braga also. The result of these operations was to place the French army in a very difficult position indeed. Both its lines of retreat were snatched from it, and it seemed that only a helpless surrender, or a struggle from which it had no hope of emerging with success, was open to it. But Soult's inventive brain hit on another expedient, dangerous, and likely to be costly, for it involved nothing less than the abandonment of the high roads of the country, and an attempt to save his army by means of forced marches over the steep and almost impassable paths across the mountains. By means of unheard of efforts and dangers, he did indeed succeed in accomplishing such a mountain march in the five days, between the 12th and 17th, and eventually reached Orense on Spanish territory, but with an army exhausted, and dismembered, without artillery, without horses, and with only about 17,000 men in the ranks.

Wellesley had not pursued his opponent after the capture of Oporto, but had turned back to Coimbra, where he arrived on the 26th, and from that time had busied himself with preparations for the advance on Madrid.

After the two opponents had thus become once more separated, an armistice was kept up between them for four weeks, and, when operations were again set on foot at the end of that time, circumstances on the French side had considerably altered owing to changes in matters connected with the command.

Napoleon was away in the Far East, on the banks of the Danube, when he heard of the renewed activity of the Englishmen. He immediately perceived that the English army must now form the principal objective of his armies in Spain. An order was therefore issued on the 12th of June that a corps was to be detached from the army of Soult, of Ney, and from that of the East, commanded by Marshal Mortier, and that another army was to be formed in this way which was to be placed under the leadership of Soult. "These three corps," in his exact words, "are only to manœuvre in conjunction with one another, are to march upon the Englishmen, are to press them without intermission, are to overpower them, and throw them into the sea. The strength of these three corps must amount to 50,000 or 60,000 men, if their junction is properly timed, the Englishmen must be destroyed, and affairs in Spain will be brought to a settlement. But we must act in combination, and not march in isolated detachments; that is everywhere a matter of first consideration, but it is especially so in a country where it is impossible to have communications. I cannot exactly specify the spot where this union is to take place because I am not conversant with all the circumstances of the case."

We shall see presently how Soult regulated the march of this army.

This order of Napoleon's was issued in fourfold to King Joseph, Soult, Ney, and Mortier. According to one authority[1] that sent to Soult contained the

[1] Bignon.

following additional paragraph. "Wellesley will probably advance along the Tagus to Madrid; in which case do you cross the mountains, fall on his flank and rear, and destroy him." No such paragraph appears in the correspondence of Napoleon; whether it be apocryphal, or whether it has been purposely omitted, I cannot say.

To judge fairly Soult's marching arrangements, we must take in view the operations which Wellesley might possibly and reasonably enter upon.

"The Lord" might repeat the manœuvre which his countrymen had already once before undertaken, embark his army, land at Corunna or Ferrol, and from thence advance against Burgos *viâ* Astorga. Or he might push forward on the great road Coimbra, Salamanca, Valladolid. Or, finally, he might move through Alcantara on Madrid.

Soult now moved his 50,000 men on the line Astorga, Zamora, Salamanca. That is doubtless a front of 20 miles,[1] but he could concentrate his army nevertheless on one flank in from 8 to 10 days. Wellesley would therefore find him across his path if he adopted either of the first named plans, while, should he make for Madrid *viâ* Alcantara, he would expose his flank and rear to an attack of Soult from the direction of Plasencia, such as Nopoleon had suggested.

Soult therefore may be said to have so far acted in accordance with what the situation demanded.

King Joseph on his side had again taken the Southern army from the Guadiana to the Tagus on the line Talavera—Toledo. It accordingly formed in combination with the guard, which stood at Madrid, a second principal group of 50,000 men.

It is exceedingly interesting at this point to note how differently the various French generals read the intention of their adversary.

Soult, to begin with, does not believe in any English offensive at all. He considers that the summer months will be too hot for any such operations, and in the autumn he intends himself to be the aggressor. He explains his ideas and views in a carefully thought out memorandum which he handed in to King Joseph.

The head-quarter staff of King Joseph at Madrid, wavered as usual between this policy and that, and at one moment believed in one possibility, and then again in another. In such uncertainty of mind action was forgotten, and finally the event came as a surprise. The Emperor alone, though far from the scene of action, made the correct forecast. On the 22nd of June he dictated to Berthier as follows: "It seems that the English are strengthening their position in Portugal; it is from there that misfortune will come upon us, if they do not lay their plans well in Madrid." And again on the 8th of July he speaks even more plainly. "Write to Madrid and tell them that a disastrous blow will come from the Englishmen, if they do not manage their affairs better there; I tremble when I think how the Englishmen breaking out of Portugal by Abrantes may surprise the King in Madrid by their movements, which will be kept quite secret with that end in view."

And what the Emperor prognosticated was what really occurred. Wellesley moved forward by Alcantara, joined himself on at Almaraz to part of the Spanish army, and entered Talavera on the 22nd of July with 60,000 men, while the remainder of the Spanish army, still 20,000 strong, under Venegas, advanced by Aranjuez on Madrid. The strategical situation which was thus brought about is one of the most interesting of the whole Peninsular war.

The army on the French right flank, 50,000 strong, was echelonned along the road Salamanca—Astorga, with its head at the latter place. That on the left under King Joseph of about equal strength was at and round Madrid. Wellesley found himself with 60,000 men at Talavera between these two bodies, and again

[1] German.

Joseph stood between him and the 20,000 Spaniards, who were coming up from Ciudad Real.

On both sides communications between the separated bodies were established, and within two days orders and informations could be sent from Joseph to Soult, and from Wellesley to Venegas, and *vice versâ*.

King Joseph, who was in supreme command, might now call the army of Soult from Salamanca to Madrid, postpone any decisive engagement until it arrived, and then deliver a great battle with 100,000 men against 80,000. This plan was the simplest, and was the one which Napoleon afterwards said would have been the most judicious. According to another scheme Soult might march through Plasencia or Almaraz, and might take the Englishmen in rear. In that case the advantage of interior lines would be left to the English, and in view of this King Joseph's force must play a waiting game, until Soult had gained the rear of the enemy, and his presence there had made a tactical impression. Meanwhile Venegas would have to be let pass on and invest Madrid.

Joseph himself favoured this second plan, probably because Soult also recommended it, and it was the one adopted. He sent General Foy to Salamanca on the 22nd of July, with orders for Soult to move on Plasencia. Foy reached Soult's head-quarters on the 24th, and on the 26th again returned to the King with a communication from the Marshal in which the following passage occurs: "My greatest desire is that your Majesty will not commit yourself to a decisive battle until you are quite certain that I have united all my force round Plasencia. We shall obtain the most important results if your Majesty refrains from fighting until the moment when the news of my march will compel the enemy to retreat. He must do this, or he will be lost."

King Joseph however paid no attention to these arguments, and, carried away by an inopportune lust for battle, moved forward, and on the 28th attacked Wellesley, who had been waiting motionless at Talavera for the last six days. He was repulsed with heavy loss.

Now the moment had come when the Anglo-Spanish might reap the fruits of its strategical manœuvre and tactical victory. The army of the King must be pursued from two directions by Wellesley and Venegas, seized between them, and annihilated. Soult's march would then have lost its object.

But in place of anything of this sort we find Wellesley again remaining inactive for five days at Talavera, and we see the astonishing spectacle of two armies, which had been locked together in a decisive struggle on the 28th of July, completely separated on the 3rd of August. On that day Wellesley marched to Oropeso in order to show a front towards Soult, and left the Spaniards after him behind the Alberche. The King left a corps on the Alberche, and moved with his main body on Toledo to deal with Venegas. The decisive point which had lain in the middle, where their stroke had not been turned to full account, had now, by the inefficiency of the Anglo-Spanish generalship, been shifted to the flanks, and that too under circumstances very disadvantageous to them, for Soult's advance began at this time to make its full strategical value felt.

The Marshal had moved with his 50,000 men through Plasencia to the Tagus, and his advanced-guard was at Naval-Moral on the 4th of August, within only a day's march of the English.

Wellesley now recognized the fact that the campaign was lost to him, for it was too bold a measure to fight a great battle North of the Tagus with an inverted front. On the 4th of August therefore he moved across the southern bank, and then began to fall back slowly by Truxillo and Badajoz to Portugal. His Spanish allies were left to their fate, which speedily overtook them in the battles of Almonacid and Ocaña.

The other advance of Wellington's, which I wish to place in comparison with

this one, took place in the summer of 1812. During the three years, which lay between the first and third offensive, the French had completed the capture of Spain, while the English had asserted their superiority in Portugal.

We must remember that in the spring of 1812 a change in the foreign policy of Napoleon took place and that the campaign in Russia was already looming in the distance. The Emperor therefore determined to act on the defensive in Spain so as to be able to withdraw at any rate some of his troops from the Peninsula, and turn them to account in the coming expedition. In accordance with this resolution the young guard, the Polish division, twelve regiments of dragoons, and some fourth battalions, in all about 25,000 of his best troops, marched out of Spain.

The corps which remained were distributed as follows—again leaving out of sight the force in Eastern Spain.

A weak Northern army was placed in Asturias and Biscaya, a strong Western army under Marmont at Salamanca. To it the Emperor had assigned the duty of protecting the line of communication, Bayonne, Burgos, Madrid, and under certain circumstances the capital itself also. There King Joseph was to be found at the head of a weak central force, while Soult was in front of Cadiz with the strong army of the South. Napoleon had impressed on his brother the necessity for giving way, in order to ensure co-operation between the Western and Southern armies, in case of possible English advance, and had indicated that, in order to gain this object, it might become necessary to evacuate Southern Spain.

The English General had rightly judged the course of events. All that he had for years past foreseen and prognosticated was now about to occur. The French army, once so proud and invincible, had been shaken to its inmost parts by long long years of guerrilla warfare, it had fallen away in numbers, and now stood scattered over a wide area. The Duke [1] therefore did not hesitate to take advantage of the chance the situation offered to him, and begin a counter attack. On the very day when Napoleon started for the Niemen the English army was to be found again on the road they had so often traversed to the North of Portugal.

But in order to sever the North and South of Spain from one another, Wellington conceived a daring enterprise, which was carried out by his most skilful lieutenant, General Hill, with a bravery equal to the ingenuity of the design.

The main road from Madrid to Cadiz runs through Almaraz over the Tagus. Marmont had fortified the passage by constructing two bridge heads which he named, in honour of his master and of himself, forts Napoleon and Ragusa. Hill got across the mountain range on the road by Truxillo to Almaraz with masterly secrecy, and assaulted fort Napoleon in the grey dawn after a night march. The French outposts did not discover their assailants until their columns with the storming ladders were within a hundred yards of the walls. A short struggle ensued, and then the weak garrison broke into headlong flight, abandoning not only the bridge but fort Ragusa on the opposite side also to their opponents. General Hill caused the works to be razed to the ground, blew up the bridges, and then marched back by Alcantara to Portugal with the same rapidity with which he had appeared.

While this bold enterprise, which completely broke off connection between the French armies, was being carried through, Wellington reached Almeida and began the offensive against Marmont. In vain did the Marshal appeal to Madrid and Asturias for help. The Northern and Central armies did indeed advance to his assistance, but they reached him too late; the decisive blow had been struck. On the 22nd of July Marmont had allowed himself to be deceived by a pretended retreat on the part of Wellington, and had assailed an adversary not only stronger

[1] The German author here anticipates a little, for Wellington was not yet a duke.—E.S.M.

than himself but strongly posted too. In vain was the *elan* of the French columns, in vain the brilliant charges of their horsemen, in vain did the *vive l'Empereur* resound as loudly and heartily as when he himself commanded. As at Busaco and Fuentes d'Onoro all the assaults on the frosty defensive and overpowering artillery of the English died away. When the sun went down that night the summits of the Arapiles saw an army flying from a defeat in the open field.

The French, according to their own admission, lost more than 6000 men killed and wounded, 7000 prisoners, 2 eagles and 11 guns. With 5000 killed and wounded Wellington did not buy his victory too dearly.

The Englishmen followed the beaten army to Valladolid, then suddenly turned southwards, and moved by forced marches on Madrid.

King Joseph, who wanted to come to the aid of Marmont with the Central army, which was only 13,000 strong, had got as far as Villacastin on his way. On the receipt of the news of the defeat at Salamanca and the approach of the English, the King however ceased to move forward and fell back to Madrid. At the same time he sent orders to Soult to raise the siege of Cadiz, and to move on Madrid by the shortest possible road. A few days afterwards this order was modified however, and the Southern army was ordered to march to Murcia *viâ* Granada, there to effect a junction with the army of the East.

The King had perceived that Soult could not be in time to save the capital, and had therefore with a heavy heart resolved to abandon Madrid, and to move the Central army also to Murcia.

When the French rear-guard left Madrid on the 12th of August a deathlike stillness lay on the broad streets of the capital; but scarcely had the hated strangers disappeared at one end of the town when the fantastically dressed guerrillas came rushing in at the other, with their dreaded leader Empecinado, at once the terror and scourge of the French at their head. Immediately all the streets became alive, the houses decked themselves with flags and carpets, and on that very evening resounding music announced the arrival of the leading troops of the English and Portuguese armies. On the 13th Wellington, at the head of his guards, made a triumphal entry into the town, which was decorated as if for a festival, and had set all its bells ringing. When finally the proud Duke appeared on the balcony of the Town Hall, and received the homage of the magistrates and inhabitants, hand in hand with the simple charcoal burner, Empecinado, the jubilation and *vivas* of the hot-blooded Southern people seemed to know no bounds. The liberation of Spain appeared at length an accomplished fact, although it was only an alteration in the strategical situation from defensive to offensive which had been brought about. I have purposely said "offensive," and not "decisive operations," because the fortune of war and the superior strategy of Soult were destined once more to snatch the laurel wreath from the brow of Wellington.

At the end of September, in accordance with the orders of King Joseph, it had really come about that three French armies forming a total of nearly 90,000 men were united in Murcia. The beaten Western army was known to have united with the Northern army, and to have occupied Burgos. The strength of this force might be placed at 30,000 men. As to its exact whereabouts and plans nothing was known, neither were the intentions of the enemy revealed in any way. It was certain however that the Anglo-Portuguese army mustered some 60,000 men, and that Wellington occupied Madrid.

Thus the French forces were divided into two large groups 90 miles[1] apart, and their opponent stood between them.

As the council of war assembled at Fuentes Higuera, when Soult, Jourdan, and Suchet each put forward their suggestions in writing, Soult's plan of campaign

[1] German.

was the one adopted. He recommended that the Eastern army should remain in Valencia, while those of the South and Centre, in all about 60,000 men, should march on Aranjuez and attack Wellington. Should they find that he had moved on Burgos, they might press on after him towards Valladolid and compel him to give battle with an inverted front.

On the 30th of September both the armies, which had accomplished marches of 80 and 50 miles respectively during the last month, started on the path which was eventually to lead them right through Spain, and what hardships did not the crossing of the Sierra Morena involve? A German officer who was with the army of the South writes of these marches :—"Imagine an army with all its guns and baggage moving on an indifferent foothpath (for a road is out of the question altogether) and one can form some idea of the difficulty of the task set to the troops. A narrow path which had hitherto only been used for mules had now to be rendered fit for carriages. The corps of engineers struggled against incredible obstacles, often having to blow away huge masses of rock, until their labours were accomplished. Circumstances were such that it was impossible to avoid danger at certain places. Wheels of guns often grazed the edges of terrifying precipices, or of crazy bridges over yawning chasms, swaying under their weight, and threatening every moment to give way and launch their loads into the unseen depths below."

In spite, however, of all such obstacles the army reached Aranjuez on the Tagus as early as the 29th of October.

Wellington had not expected such an operation. He had spent three weeks in Madrid amusing himself with festivities, illuminations, and bull fights, and had then marched with his army by Valladolid on Burgos in order to follow up his victory over the army of the North.

When the English turned towards Madrid after Salamanca this force had advanced again to the Douro, but when Wellington now again advanced upon it it fell slowly back on Burgos. Its leader, General Souham, determined to await the arrival of Soult in this strong position, and not to give his adversary a chance against him. With this end in view, therefore, he fortified Burgos, which was well situated for such an object, barred the road, by means of field entrenchments, garrisoned the works strongly, and placed himself with the army in position at Briviesca, about five miles on the north-east of Burgos.

Wellington in place of going round the well fortified rear-guard position and assailing the army, commenced to lay a regular siege to the town. But now the fortune of war deserted him. The successful defence of Burgos under General Dupreton, which lasted for a whole month, has a place amongst the most brilliant feats of arms which are recorded of the Peninsular war. After Wellington had vainly stormed the town three times, and in so doing had lost 92 officers and 2000 men, he received news of Soult's march to the Tagus, and felt compelled to raise the siege and fall back slowly across the Douro to Salamanca. Souham followed him immediately, and Soult redoubled his forced marches in order to try and cut the English off from Portugal. But unfortunately for the French his efforts were in vain. He was too late, even if so by two days only.

On the 8th of November Wellington reached his strong position on the Arapiles, where three months and a half before he had won his celebrated victory; and was then secure of his retreat. On the 10th the two French bodies of troops united together, but before in place of behind him. Yet Soult still hoped to compel his prudent adversary to fight on an inverted front. The French army therefore drew its strength together on its left, crossed the river at and above Alba de Tormes, and on the 14th moved in heavy masses towards the Salamanca-Ciudad Rodrigo road, along which ran the English communications to the rear. But Wellington gained information as to his intentions in the nick of time, and under

cover of a heavy mist, which shrouded the low ground near the Tormes, succeeded in marching away, and once more eluded the grasp of the French.

On the 18th of November he again reached Ciudad Rodrigo, and the security of Portuguese soil. But Spain was once more in the hands of the French.

These two campaigns, whose leading features I have thus tried to sketch, called forth the liveliest contemporary interest, and most distinguished men have left us their views about them. The operations of Wellington have been favourably criticised as regards their execution, but show no trace of the highest genius. Indeed it is these very operations and those which preceded the battle of Waterloo which caused contemporaries and later generations to come to the decision that the English commander came just short of that stature by which great leaders tower over average generals.

In both campaigns Wellington enjoyed the advantage of interior lines. At Talavera he stood between the two hostile groups of his opponents in Plasencia and Madrid, just as three years later he found himself between Burgos and Murcia. But criticism exacts signs of the very highest genius for war from those who would carry out operations on interior lines successfully. For it is here not only a matter of sound calculation as to time and space. A quick appreciation of the situation, keen enterprise, rapid, energetic action, and the greatest personal influence, are demanded from him who is in command. His personal characteristics now come prominently into the foreground. And the tool he handles, his army, must also be well adapted both for marching and fighting. The operations of Frederick the Great between Rossbach and Leuthen and those of Napoleon in 1814 are justly considered the most brilliant examples of their strategy, while the tasks accomplished by their men form the most distinguished episodes of Prussian and French military history. During the campaign of 1866 the Austrian army of Benedek likewise stood on interior lines from the 27th to the 30th of June, but Benedek did not fully utilize the time at his disposal, and on the 1st of July the situation had already so completely altered that the advantage of the interior lines had been transformed into the disadvantage of being tactically closed in, and that the defeat of Koniggratz was almost a foregone conclusion.

Criticism has not failed it is true to extend respect and heartfelt sympathy to Benedek and his brave troops, but it has at the same time denied to him the title of a great general.

Lord Wellington now holds a position midway between Frederick the Great and Napoleon on the one side and Benedek on the other. His biographer says of him. "No general ever left less to chance. It was his conviction that in military matters, as in life generally, success is more surely attained by a methodical attention to rules than by any sudden inspirations or extraordinary combination of favourable circumstances. Although he was not lacking in either resolution or bravery, nay even if his character rather spurred him on to bold strokes, yet his reason urged him to go along the slower but surer road which experience pointed out."

Wellington like Benedek did not utilize time, of which, especially in 1812, he had plenty, as he might have done, but he escaped from the difficulties thus engendered by a timely retreat. Yet in spite of tactical victory he was strategically beaten in both campaigns.

In the year 1809 it is certainly the case that the main blame must rest on the troops he led, and therefore this campaign is measured, at any rate, by the English, according to a less exacting standard. The army which conquered at Talavera, or perhaps, to speak more correctly, there repulsed the enemy's attack, was composed half of Anglo-Portuguese troops, and half of Spanish. The Spaniards failed to fight altogether, and of the remainder a good fifth lay dead or wounded on the field. Strictly speaking Talavera was an undecided

battle, and when fighting on interior lines such an one almost amounts to a defeat. But now Wellington during three years showed undisputed skill and talent in organizing and training his Anglo-Portuguese army. When he entered on the campaign of 1812 his army was therefore one of the best in Europe, and its failure is not to be attributed to anything but defective leadership.

Critics of all nations are agreed that Wellington, after the battle of Salamanca, might, and should, have destroyed Marmont's army by pursuing it energetically and vigorously through Valladolid and Burgos or even to Bayonne. Then would the veins which supplied life blood to the French armies in Spain have been tied, and soon that paralysis (to use an expression of Napoleon's), which is the precurser of death, would have supervened. Instead of doing this, Wellington turns on Madrid, and having spent four weeks there doing nothing, returns once more to go to—Burgos. Although usually the centre of gravity of resistance in centralized states lies in their capitals, and though there also is located the centre of force and movement, and although therefore, when the field forces have been shattered, capitals generally form the most important objects of operations, Madrid, in view of the independence of Spanish provinces, was an exception to the general rule. In this case therefore the march on the hostile capital, and the delay there of four weeks duration, was a veritable waste of time, and made it possible for Soult first of all to march from Cadiz to Murcia, and then from Murcia to Salamanca, and thus twice traverse the whole Peninsula.

The French forces in both campaigns were divided into two groups with their opponent between them. They operated therefore on exterior lines, and in both cases it was the army led by Soult that brought about decisive results. Yet wonderful to relate it is Soult in both cases who is most bitterly blamed by French historians, who are led astray here principally by Thiers. The author of "The Consulate and the Empire" throughout judges the most gifted of Napoleon's generals unjustly and with prejudice. The future President of the third Republic displays a warmer interest in such persons as the weak and good-natured King Joseph, the plebeian Jourdan, the revolutionary General Massena, and the heroically brave, but indiscreet Ney. When he speaks of them his language assumes a glow, they appear to him to be representative of the French national character, their errors are explained away, or sometimes shouldered on to some one else with the dialectical skill of a trained advocate.

The proud, aristocratically-minded, self-contained, masterful Duke of Dalmatia, who had courage enough to aim at a kingly diadem, such an one as he must perforce be regarded unsympathetically by an historian of Republican proclivities.

John Nicholas Soult, the son of a peasant, was 39 years of age when the Peninsular war broke out, but had already been a General for 14 years. He had held the command of the Imperial Guard ever since 1802, and had distinguished himself in all the wars of the Consul-Emperor. During the Pyrenean campaigns he was the real leader of the French, although Massena, Marmont, and, to a certain extent, Suchet at times occupy the foreground more prominently. The Spaniards were perfectly well aware of this, and they hated and feared no Frenchman (with the exception of Napoleon) so cordially, notwithstanding which, however, they conferred on him the title of "the great Captain."

Singularly well fitted for a soldier's life, and with high intellectual endowments, Soult presented in his person a commanding appearance. In stature and features he was not unlike Gneisenau, without, however, possessing the amiable qualities of that General. He was, on the contrary, overbearing, haughty, self-willed, and fond of display. His head-quarters glittered like a royal court; his relations to Napoleon were quite exceptional. One who knew Napoleon's court society well, the gifted Madame de Remusat, tells us in her memoirs that the Emperor had seen something of a rival in Soult, had often been jealous of him, had even

occasionally feared him, for the ambitious, clever, and unmannerly Marshal had dared to oppose his Lord and Master, and to propose terms to him. In spite of that, or even perhaps on account of it, Napoleon valued the General highly, and the judge, who was usually so severe, very seldom addressed the language of blame to Soult, not even after his adventure in North Lusitania. It is true, certainly, that blame in Napoleon's mouth would here have sounded like mockery, for he himself had often boasted that he found his crown lying on the road side, and had picked it up with the point of his sword. But the highest token of his appreciation was given by the Emperor when he selected the Duke of Dalmatia to be his chief of the staff in 1815 in the place of the unfaithful Berthier.

It is this Marshal forsooth that Thiers holds responsible for the defeat of Talavera, this man who succeeded in converting that disastrous event into a strategical victory. With what justice let us now see.

To manœuvre two separated groups, so that they shall combine to bring about a tactical crisis in front and rear of your opponent demands an even nicer calculation of time and space than do operations on interior lines, and the marching powers of your men must equal your skill in calculation.

When King Joseph attacked Wellington at Talavera on the 28th of July, he counted on Soult's having reached Plasencia on the 30th of July. The calculation was wrong by five days. A measurement of the distance on the map will show this. And such was the view taken by the Emperor. He has written on this point as follows.[1] "It was quite evident that Marshal Soult could not arrive at Plasencia before the 4th of August, because he would not be likely to make the error of marching without the 6th Corps, which could not do the distance from Astorga sooner."

Thiers of course asserts—and he bases his statement, he tells us, on the memoirs of Jourdan and the correspondence of the Marshals—that General Foy on his return from Salamanca had repeatedly said that Soult would reach Plasencia on the 30th of July. That may very likely be so. But, even so, how would it justify King Joseph in attacking at Talavera on the 28th? Soult had particularly begged him not only to avoid a decisive action until he was at Plasencia, but to avoid one until his march to that place had compelled the English to turn round, that is to say, until the strategic movement had asserted its influence tactically.

When during the mid-day hours of the 3rd of July, 1866 the advance of the 2nd Prussian army came to a standstill opposite the position of Chlum, the eyes of the head-quarter staff were turned with anxious expectation towards Horenowes, from whence too in due time the army of the Crown Prince entered into the struggle. In this case the calculations as to time and space were sound. But such was not the case at Talavera. It is 20 miles from Plasencia to Talavera, or, supposing that Soult's army made great efforts, four days march. It could not therefore be expected to fall on the rear of the English before the 3rd of August, even if it left Plasencia on the 30th of July. Joseph's attack, entered upon, be it noted, against the advice of his staff, was therefore premature by 5 days, and Soult is clearly not to be blamed for the resulting defeat.

Another question is opened when we consider whether it would not have been better policy for the French to have altogether abandoned the idea of operating on two lines, and to have endeavoured to have united their forces for a decisive battle. Such a contest would then have assumed the form of a frontal attack on their part in lieu of the more promising encircling operations. Thiers says it would, and quotes the criticism of Napoleon on Jourdan and Joseph. But the censure he refers to is only to be understood if the personal capabilities of Joseph are kept in view. The Emperor so thoroughly appreciated the difficulties attending an attempt to completely surround an adversary, an operation which he had him-

[1] To Clarke, Schönbrunn, August 21st, 1809.

self often carried out, that he could not but fear lest the necessary movements, when under the guidance of his brother, might miscarry.

Subsequently in a letter to his stepson Eugene when discussing a similar situation, he thus speaks of operations against an enemy's communications. "A manœuvre which I indicate, that I do not recommend, but which I myself would carry out, would be ——;" and again further on, "but I do not recommend the bold manœuvre to you. That is my manner, and for it one must thoroughly understand all the details and methods of procedure; the object which is in view, and the blows which must be struck."

For the average general therefore these manœuvres are too complicated and too dangerous; but his most skilful Marshal might surely permit himself to make war in the manner of the great Emperor? A letter to Soult of the 20th September, 1809, written therefore when Napoleon had been thoroughly posted up in all the operations both before and after Talavera, illustrates this. It begins with the words, "I was dissatisfied with your conduct," then follows a sharp and searching criticism of the operations at Oporto, of the retreat to Orense, which had resulted in the loss of the artillery and train, and then he says: "I forget what has occurred, I hope that it will be a lesson to you, and I entrust you with the post of Major-General of my forces in Spain. The King is without experience in war, and it is my desire that you should be responsible to me for the events of the war."

There is no hint therefore of blame for the march to Plasencia.

We have a very similar example in modern military history. When, on the 19th of January, 1871, General von Manteuffel determined to give up direct communication with General von Werder in order to lay himself in front of his opponent and cut him off from his line of retreat to French territory, Count Moeltke told his Majesty the Emperor that General Manteuffel's operations were too bold and enterprising, but that they might nevertheless lead to great results. If he were to meet with a reverse he should not be blamed, for in order to arrive at great results something must be set at stake.

When recording the operations in the autumn of 1812, Thiers has again only unfavourable criticism for Marshal Soult.

He will not even give him credit for conceiving the project of the decisive march, but bestows it on Jourdan because he had recommended the movement from Murcia by Guadalaxara and Calatajud on the Ebro and up that river to Burgos. But such was not Soult's conception at all. The plan suggested by Jourdan had for its object the union of the two French bodies of troops at Burgos, and a subsequent frontal attack by them; that of Soult's movement on Valladolid was, as in 1809, the hemming in of the enemy.

The marching powers of Soult's troops were in both campaigns strikingly exhibited. The distances between the beginnings and endings of their marches are as great as those which separate Berlin from Metz and Mainz. The army, or at any rate portions of it as strong as an army corps, covered in 1809 distances of 60 miles in 14 days, and in 1812, of 80 miles in 22 days, which shows an average of $3\frac{1}{2}$ miles[1] per day. Moreover we have to remember that these distances are measured as the crow flies, and that in both cases lofty mountain ranges had to be traversed.

These two campaigns of Soult's supply us therefore both in conception and execution not only with a most interesting parallel in military history, but form turning points in the ever-changing course of the great war of independence. They were unmistakably decisive as regards the possession of Spain by the French.

The Emperor Napoleon, when he began his operations on the Elbe in 1813,

[1] *See* p. 2.

felt that he could not dispense with the assistance of Soult, and accordingly called him at the end of February to Germany in order that he might take over command of the Guard Corps. But Soult only stayed a short time at Imperial head-quarters. Disastrous news from the Peninsula caused Napoleon again to send the Duke of Dalmatia to the Pyrenees as commander of all his forces that were fighting there.

The remedy should however have been tried earlier.

On the 11th of May the English had begun their fourth offensive movement, and had directed their stroke this time at the French line of communications. On the 21st of June the army of King Joseph was attacked while retreating at Vittoria, was surrounded, beaten, and almost completely annihilated. When Soult reached Bayonne on the 13th of July, 1813, and took over command of the decimated and demoralized army, it had already been for six days on French soil.

Spain was free from the pillars of Hercules to the Pyrenees.

PRECIS
AND
TRANSLATION.

THE MEMORIAL DE ARTILLERÍA, MADRID.

October and November, 1895.

(A REVIEW.)

BY

LIEUT.-COLONEL J. C. DALTON, R.A.

THIS valuable monthly artillery periodical which always contains matter of interest to artillerists, has in its numbers for October and November last some articles which are specially worthy of notice. I do not propose here to do more than give a sketch of them, though possibly later I may allude to the first of them again as it possesses peculiar interest for us.

In the *October* number there is an article by Colonel Salvador Ordoñez,[1] Sub-Director of the Artillery Gun Factory at Trubia, on a scheme for the defence of the Bay of Algeciras (opposite Gibraltar) with heavy ordnance. Similar schemes have been treated of on more than one previous occasion by Spanish artillerists, but as time goes on and conditions affecting heavy guns and the communications in that part of Spain alter, a scheme of this kind gets obsolete and has to give place to a new one. Anything that Colonel Ordoñez writes is worth studying, for he is one of the most prominent of the Spanish Artillery Officers and his name has been more than once brought by me before the readers of the "Proceedings" in connection with his works on Coast Defence and on the Ordoñez system of heavy ordnance which is that now adopted in a large degree by the Spanish Government. His present article which we are noticing commences with a description of the town of Algeciras, its resources as a commercial port, its strategical position with reference to Gibraltar, etc. He then describes Gibraltar minutely and deals with its defences and armament. He recognizes its great importance to England and scouts the idea, which he hears frequently ventilated, that to fortify the positions which dominate Gibraltar would be an unfriendly act to Great Britain. He deals

[1] Colonel Ordoñez has lately volunteered for service in Cuba where he arrived in January, 1896.

in detail with these different positions and assigns to each part of them the armament which he considers should be allotted. This is given in the form of tables which show what guns he proposes to place in each battery, together with the ranges from these batteries to various points in Gibraltar. It will be sufficient for our purpose now to mention that to—

(1.) *Sierra Carbonera* (The Queen of Spain's chair) he assigns 14 guns and 20 howitzers, distributed in 4 batteries.

(2.) *Punta Mirador*, 4 guns.

(3.) *Punta Rinconcillo*, 12 guns and 8 howitzers.

(4.) *Punta de San Garcia*, 4 guns and 4 howitzers.

(5.) *Punta Carnero*, 6 guns and 8 howitzers.

This makes a grand total of 40 guns and 40 howitzers.

Of these (1) and (2) face Gibraltar.
„ (3) is for the central defence.
„ (4) and (5) defend the entrance to the bay.

He eschews casemated works or cupolas and recommends barbette batteries, with ample space for well ventilated and lighted magazines, shell rooms and stores, with good communications, the pieces to be protected by solid earthern parapets and traverses. Such works would be rapidly executed and economical. In some places batteries could be concealed from view and used for high angle fire.

All the pieces which he proposes could, from the positions assigned to them, range easily to Gibraltar and could completely command the entrance to the bay and the ships therein and prevent the re-victualling of the fortress if necessary.

Such is a very brief outline of a scheme which is carefully thought out. The question of expense has not been gone into in his paper. But, we take it, that considering the absolute want of roads in that neighbourhood and the rocky and difficult nature of the ground, this question of expense alone (especially at the present moment with the enormous cost of the Cuban rebellion to be met by Spain) makes any scheme of this nature, however cleverly worked out, practically impossible.

Another article in the same number is by D. Francisco Fernández de la Puente and describes the formation of an 11th Battalion of Fortress Artillery at Cadiz for service in Cuba. This has been done by levying contributions of N.-C.O.'s and men from 3 of the existing Fortress battalions. The new battalion consists of 6 companies, the strength of a company being :—

1 Captain.
3 1st Lieutenants.
1 2nd Lieutenant.
5 Sergeants.
10 Corporals.
4 Trumpeters.
4 First-class Gunners (Artilleros primeros).
111 Second-class Gunners (Artilleros segundos).

The regimental staff consists of 1 Lieut.-Colonel, 2 Majors, 1 Captain as Adjutant, 1 Captain as Paymaster, 1 1st Lieutenant, 1 Medical Officer, 1 Chaplain, 1 Armourer, 1 Sergeant Trumpeter, 1 Corporal Trumpeter. The equipment is suitable for the country in which the battalion will serve and the carbine is the

Mauser. A list of the officers is given, and we note that the Lieut.-Col., D. Guillermo Cabestany, two Majors and one 1st Lieutenant are volunteers, whilst the others have been selected by lot. Amongst the Majors is D. José Brull, a name well known in connection with small arms and fuzes, and he will be second in command.

The battalion embarked at Cadiz midst much enthusiasm on August 21st last, after having attended Mass in the Cathedral.

In the *November* number D. José Arántegui explains his design for a 12^{cm} (4·7 in.) B.L.R. mortar or howitzer, and goes at some length into the mathematical calculations by which he has arrived at the dimensions which he recommends. The main points about this piece are, that it is composed of two parts, viz. the screwed-in breech (containing the cartridge chamber) and the breech closing apparatus of steel, the rest being of compressed bronze.

The weight of the piece complete is 5½ cwt.
Total length is 32·6 inches.
Calibre, 4·7 inches.
The projectile weighs 48·5 lbs.
Bursting charge, 2·4 lbs.
Length of projectile, 3·3 calibres.
Charge, 2·2 lb. smokeless powder (Wolff).
Maximum range, 4400 yards.
Angle of descent corresponding, 48° 6′.
Remaining velocity, 597 f.s.
Time of flight, 29 seconds.
Initial velocity, 670 f.s.

There is also an article on Cuba (continuation) by D. Francisco de Moya, which contains a useful plan of the town and port of Havana on the scale of $\frac{1}{40\,000}$.

In the bibliography at the end of this number there is a notice of a comprehensive geography of Marocco[1] furnished with maps and plans by Colonel T. Bermudez Reina who was, until recently, the Spanish Military Attaché in London. He was for some years Military Attaché in Tangier, and is well known as an intelligent and diligent writer. It begins with an introduction mainly ethnographical, followed by four chapters :—

Chapter 1. Geographical, orographical and hydrographical.

Chapter 2. Tribal and territorial division of the country, with plates showing Tetuan, Tangier, Larache, Salé and Rabat and Mogador, showing fortifications and describing the armament.

Chapter 3. *Resumé* of the geography of the country—with a map.

Chapter 4. Itineraries.

Appendix. Military organization of Marocco.

Another book noticed is "Reflections on the defences of Minorca" by Captain Tenés y Muñoz of the Artillery, published this year in Mahon, being a reprint of 22 newspaper articles from *El Eco Militar* by the author under the *nom de plume*

[1] A fuller notice of this book appeared in the journal of the United Service Institution for February, 1896.

of *Candileja*. In these articles the author severely criticizes the defences of Port Mahon under the existing conditions of naval warfare, and suggests remedies.

The *November* number winds up with a translation of part of my article in the January number of the "Proceedings" for this year on "Ancient British guns in the Artillery Museum at Madrid." This was found amongst the papers of the late Lieut.-Col. D. Felipe Arana of the Artillery, and has been completed by the editor of the *Memorial*. The paper in question is a kindly notice of my article, the only special remark made being that two of the guns, Nos. 3 and 4 in the catalogue which are mountain guns on their carriages, were captured from the British troops on the occasion of their unsuccessful attack on Santa Cruz de Tenerife on July 25, 1797.

In my paper I remarked that I had not seen any guns which appeared to have been taken from the English in war. As the editor points out, there were these two guns there, but from a feeling of delicacy they were not pointed out to me at the time of my visit.

I take this opportunity of thanking my Spanish Artillery comrades for their invariable courtesy to me on the many occasions when I have been in their country and in correspondence with them.

There is also a friendly notice of my recent précis of Lieut.-Col. Gabriel Vidal's article on the "Employment of Artillery in Cuba."

In the *January* number for 1896 Lieut.-Colonel D. Gabriel Vidal continues to discuss the desirability of having horsed rocket batteries for the campaign in Cuba, and in an interesting article, which is to be continued, he deals with the proposed establishment and armament of these batteries.

He is strengthened in his conviction of the necessity for these, from the fact (which he bears out by quotations from the Press) that the Cuban Insurgents had actually provided one of their filibustering expeditions which are being organized by the rebel leader Collazo, with war rockets made of aluminium, on the system invented by one Captain Couspiere—this expedition was fortunately frustrated.

PRÉCIS

AND

TRANSLATION.

"REVUE MILITARE DE L'ETRANGER."

August, 1895.

"FIRING AT CAPTIVE BALLOONS."

BY

LIEUT.-COLONEL J. H. G. BROWNE, LATE R.A.

THE increase in the range of fire-arms, which often necessitates beginning the combat at a considerable distance and the adoption of the principle of indirect fire, have led up to the provision of elevated and movable points of observation, from which the enemy's troops, batteries, and field-works may be reconnoitred. Hence the introduction of the captive balloon into the equipment of the armies of all the great European Powers.

When once in possession of this new appliance, it was naturally sought to utilize it, even in field-warfare, in order to observe the march of the enemy's columns to find out where the main body of his troops are located and to ascertain their strength and approximate composition.

No sooner had captive balloons made their appearance than suggestions were made on every side with a view to their destruction. Various military newspapers gave an account of the experiments made in France with this object in view, particularly of those of 1885 and 1887 in Germany, of 1891 in Russia, and of 1894 in Austria.

On the 10th July last at the fortress of Steinfeld, about 40 miles from Vienna, some new experiments took place, which were attended by officers of the School of Musketry and of several regiments of artillery, as well as by a certain number of officers of the same arm, who came from Vienna, and from garrisons more or less distant, even from as far as Galicia—a fact which bears witness to the importance attached to these trials.

Before giving the results obtained at these experiments, it will be useful to give a summary of some of the preceding ones.

In 1885 and 1887 shrapnel was fired from the fortresses of Tegel and of Kunnersdoff in Germany.

A balloon placed at 1400^{m} from the guns and at an altitude of 400^{m} was struck in the course of several rounds and fell rapidly.

Two other balloons placed at an elevation of 100^{m} to 250^{m} and at 5000^{m} distant from the battery fell, the one after 10 shots, the other after 26, each of them pierced with 20 holes.

In 1891, at the fortress of Oust-Ijora, in Russia, a battery of 4 light field-guns fired shell loaded with bullets at a captive balloon at a horizontal range of 650^{m} and at a vertical height of 200^{m}. An observer, placed at about 1000^{m} on one side, transmitted by telephone the corrections to be made in the range and elevation.

The weather was calm and clear and the balloon oscillated laterally through about 20^{m}. Ten single rounds were fired and afterwards salvoes.

After 30 rounds (the 5th salvo) the balloon began to descend slowly ; it had been pierced by 5 splinters and 25 balls.

The author of an article which appeared in the *Rousskii Invalid* concludes from this that firing at a captive balloon does not, as a general rule, present any serious difficulties when a lateral post of observation is available.

He estimates that the balloon will not be able to remain in the air for more than a quarter of an hour at the most.

In 1894 a series of experiments were made in Austria with the following results :—

(1). Fire against a balloon at an elevation of 400^{m}.

After 16 rounds the balloon sank slowly. It had been struck 10 times.

(2). The same target under the same conditions.

The balloon not having fallen at the end of 20 rounds it was lowered by the ropes. It had been struck by 18 splinters.

(3). Fire at the same balloon, which had been repaired and sent up to an elevation of 400^{m}.

After 40 rounds, the balloon, which had only been hit once, but seriously, fell with great rapidity.

(4). Fire at 3000^{m} against a balloon at an elevation of 300^{m}.

After being struck by 9 splinters or bullets, the balloon still retained its ascending power.

(5). Fire at 3750^{m} against a balloon at an elevation of 800^{m}.

The wind was fresh and the balloon oscillated violently ; after the 65th round it fell rapidly. The projectiles had made two large rents in it.

It was as a sequel to this series of experiments that the new trials, of which we have mentioned, were carried out at the fortress of Steinfeld on the 10th of July last.

This time the point of departure was different. In the experiments made before, whether in Austria or elsewhere, the special object had been to determine the number of hits necessary to bring down the balloon and to study the manner in which fire against a target of this kind should be directed. But in these last experiments the Austrian officers seem to have acted on a different principle.

The balloon has only one enemy, namely the cannon. It is desirable, therefore, to endeavour to secure it against the artillery projectiles aimed at it, by studying altitude, distance, and movement.

The difficulty of laying the gun increases with the altitude of the balloon. Sometimes even it is necessary to dig a hole for the trail, which makes the service of the piece slow and difficult, especially when direction has to be changed. The balloon therefore should be as high as possible. But, as observation is the first essential, the elevation to be given to the balloon is limited.

The Austrians think that an altitude of about 800^{m} has the advantage of spoiling the effect of the enemy's fire, whilst at the same time allowing observations to be made.

With regard to distance, the conditions sought for are as follows :—Place the balloon outside the effective range of Field Artillery (about 4000^{m}) without being so far off as to prevent the points, which it is wished to examine, from being clearly distinguished from the car.

Lastly, any motion given to the balloon, whether vertically or laterally, renders the regulation of fire especially difficult. If movement spoils the observation of the balloonist, the motion must be intermittent, as has been the case in the more recent experiments, the officer in the car taking advantage of the moments of rest to make his observations.

These were the ideas which seem to have guided the experiments made in Austria on the 10th July last. They were also carried on under conditions which approached as near as possible to those of real warfare.

The balloon was placed at about 5000^{m} from the battery, and at a height of about 800^{m}, and it was twice put in motion during the execution of the fire.

Some details of these experiments are as follows :—

The balloon 'Budapest,' which was 10^{m} in horizontal and 14^{m} in vertical diameter, was rapidly raised to a height of 800^{m}. As soon as it showed itself above the horizon an eight-gun battery of 8^{cm} (about 3 inches) calibre began firing shrapnel at it, at a range of 5250^{m} (7000 paces). The angle of elevation varied from 25° to 27° and trenches had to be dug in the ground for the trails of the gun-carriages.

After firing 8 rounds, an extreme limit of about 1000 paces was determined, and the captain was taking steps to find the range accurately, when the "pointeurs" informed him that the balloon was in motion. This movement, which was slow, might with the naked eye have been confused with the oscillations which always take place with captive balloons, but the 'pointeur,' keeping his glass constantly fixed upon his target, clearly distinguished it. The range had to be obtained afresh.

As soon as this second range had been approximated to, the balloon again changed its position and everything had to be begun over again. The 80 shrapnel allotted for the experiment were soon exhausted. They had liberated about 10,000 bullets on bursting and the balloon continued to float tranquilly in space.

When the balloon was lowered it was found that it had three small holes in it, which did not seem to have affected its ascending power.

The battery was commanded by the captain-director of the School of Gunnery, the rest of the detachments had not received any special previous instruction.

From general results of these experiments we may draw the following conclusion :—

(1). A balloon may be struck a number of times by bullets or by small splinters without losing its ascending power, but a single rent of considerable size, made by a whole projectile or by a large splinter, will cause its immediate fall.

A captive balloon which is placed at an elevation of 800^{m} and at a lateral range of 5000^{m} from the hostile artillery and which changes position at intervals when the enemy's fire is becoming dangerous, has a great chance of remaining intact.

From these premises we may deduce the position which a detachment of balloonists with their *matériel* ought to occupy on the line of march of a column.

Taking the case of an army corps marching upon two or more roads—and supposing the balloon-park to be with one of the columns, say a column of division, should it be placed with the advanced-guard, with the main-body, or in the interval between the two ?

The advanced-guard encounters the enemy and takes up an artillery position at a distance generally estimated at something between 2000 m and 4000 m.

Whilst this artillery comes into action, the main-body of the column is massed in rear at a point selected by the General Commanding. The latter would wish to employ the time required for this concentration by making use of all his means of information in order to determine the position of the enemy's troops, and to find out whether reinforcements are coming up to him. If the balloon is then near at hand, it will be able to render him good service.

We have already seen that the balloon ought to be kept at a distance of about 5000 m from the hostile artillery, that is to say, from 1000 m to 3000 m in rear of the position of the friendly batteries. It would seem then that the balloon-park ought to march at about 3000 m in rear of the artillery of the advanced-guard and nearly at the head of the main-body.

As it is well to give a certain amount of play between the different parts of a column, the best place for the balloon-park would be, in this case, between the advanced-guard and the main-body from 300 m to 500 m in advance of the latter.

There would, however, be no hard and fast rule. It is evident that everything will depend upon the situation and upon the intentions of the General Commanding. If, for instance, he wishes to avoid fighting and the orders of the advanced-guard, on meeting the enemy, are only to contain him so as to give time for the main body to change direction, then in that case the balloon-park, if placed at the head of the main body, would only be in the way and likely to impede the movements of the troops.

Without prejudice to any conclusions which may be arrived at from past or future experiments, there is no doubt that, just as the losses of troops, which cannot be covered from the view of the enemy's artillery, may be diminished by the adoption of suitable formations, by keeping them out of dangerously close ranges and in motion, so, in order to protect a captive balloon, advantage should be taken of *altitude*, of *distance*, and of *movement*.

PRÉCIS

AND

TRANSLATION.

"JOURNAL DE GENÈVE."

THE EFFECT OF ELECTRICITY ON THE FLIGHT OF PROJECTILES.

BY

CAPTAIN W. C. HUNTER-BLAIR, R.A.

THE Committee of the Federal Shooting Association made a curious discovery lately in tabulating certain results of shooting. It observed that on the range at Winterthour the majority of shots fired at the targets on the right of the range struck to the right of the bulls-eye, while on the targets on the left of the range the greater number of hits were to the left of the bulls-eye. It was further discovered that all the projectiles constructed either partly or wholly of steel had become magnetized during flight.

The Federal Experimental Committee having had these facts brought to their notice, thought that possibly they might have some connection with the existence of the numerous wires used for electric bells and telephones on either side of the range. Several additional experiments were made on other ranges, and the results fully bore out this theory.

An electric current of 8000 volts was installed on the range at Thun by means of four 18 mm cables laid parallel to the line of fire and 40 m from it. In order to define the trajectory, screens of thin paper were fixed at every 10 m along the range.

The first trials were made with the 1889 pattern rifle. The influence of the electric current made itself felt at once; at 260 m the lateral deviation was already 24 m. The trajectory showed a very remarkable curve towards the electric current.

A second trial was made with the Japanese gun of 3·3 mm invented by Colonel Yamagata. The minute bullet went straight for the electric wires, broke two insulators, and followed along the wires, finally wearing out its energy with the friction.

Experiments were then made with artillery. The results obtained were no less startling. The range was 3000 m, and the electric current was installed as before commencing at 2800 m, *i.e.* 200 m in front of the target. The lateral deviation of the shell (common) was 14°. Firing with shrapnel produced even more curious phenomena. The head of the projectile, carrying the fuze made of a non-magnetic

metal, was completely detached, while the body was attracted by the current, the bullets after burst showing such extraordinary variations that all accuracy of fire was totally done away with.

It was proved by these experiments that the force of attraction increases in inverse ratio to the weight of the projectile and also to its velocity. A section of infantry exposed to the fire of hostile infantry at 300 m and having on one flank an electric current (by means of a dynamo or accumulators) would have nothing to fear from the enemy's bullets. A company at 500 m could be protected in a similar way, and a like arrangement would be a safeguard from artillery fire at from 900 to 1400 m.

PRÉCIS

AND

TRANSLATION.

"REVUE D'ARTILLERIE."

NEW RUSSIAN REGULATIONS REGARDING THE TACTICS AND FIRE DISCIPLINE OF THE BRIGADE DIVISION.

BY

LIEUTENANT A. W. TAYLOR, R.H.A.

THE Russian artillery has only been organised into brigade divisions since the beginning of the year 1895. Till then no brigade divisions were permanently constituted and the command of any collection of batteries which chanced to be together during an action devolved upon the senior battery commander.

As it was found that the orders for drill and fire discipline did not adequately satisfy the demands of the new organisation, the Russian artillery committee has lately issued two sets of regulations, called schemes, which have at once come into force. These do not appear to be applicable to batteries of Horse artillery, which consist of six guns and twelve wagons, as against eight guns and sixteen wagons in heavy Field batteries and eight guns and twelve wagons in light Field batteries. The brigade division consists of two or three batteries under the command of a Colonel, the brigade under the command of a Major-General consists of six batteries. It will be seen that the subdivision of the battery into two units when in action, one consisting of the gun line and first line of wagons and the other of the rest of the wagons, spare men and horses, etc., is the most important innovation. Thus, in action, the last-named units of all the batteries of a brigade division are collected under the command of an officer who is responsible only to the brigade division commander, and battery commanders have no authority over the wagons of their batteries except over the first line of wagons which form an integral part of the gun line. Below is given a *résumé* of the principal paragraphs of these two documents:—

Scheme for regulating the manœuvring of brigade divisions.

(1.) To the brigade division commander are attached:

One Lieutenant.

Note.—This officer and the trumpeter mentioned later form part of the staff of

the brigade division in time of peace, the Lieutenant being called adjutant of the brigade division commander.

One battery officer selected by the brigade division commander as commander of the brigade division *combat échelon* (described later).

Three or four connecting files, mounted, one from each battery and one from the brigade division combat échelon.

One scout mounted, *one observer* dismounted and *one trumpeter*.

The scout, observer and connecting file of the brigade division combat échelon are sent to the brigade division commander whenever he orders them up. The connecting files of the batteries join him as soon as the brigade division has assembled.

(2.) The brigade division is composed of two or three batteries. Each battery is subdivided into the *combat artillery* consisting of eight guns and four wagons, and the *combat échelon* consisting of the remaining wagons (twelve in the case of heavy and eight in the case of light field batteries), G.S. and ambulance wagons.

(3–4.) These paras. refer to words of command which are given as laid down in the Regulations of 1884. Signals are only used to accompany words of command.

(5.) The regulation paces are the walk and trot, the pace of the walk is about four miles an hour, the ordinary trot eight, and the trot-out twelve miles an hour.

(6.) The brigade division formations, whether halted or on the move, are the *formation for action* and the various *column formations*.

Formation for action.

(7–8.) In the formation for action the interval between batteries is about 21 yards. In each battery the guns may be either—

At full interval	(polnyi)	or about	21	yards.
,, half ,,	(tiesnyi)	,,	10	,,
,, close ,,	(somknoutyi)	,,	5	,,

the four wagons of the combat battery formed in column are placed 50 paces in rear of No. 5 gun of their respective batteries. In the *battery formation* these four wagons are placed in rear of the centres of their respective sections at a distance depending upon local conditions.

Officers' posts.—Except at reviews and inspections the brigade division commander and battery commanders select the positions which appear to them the most suitable for making their words of command heard.

(9–10.) *Forming line.*—The brigade division forms line on the centre battery unless orders to the contrary are given.

(11.) In the *direct advance* the brigade division commander names the directing battery and points out the direction. The commander of the directing battery is responsible for direction and pace. The other batteries must pay particular attention to the correct keeping of intervals.

(12–16.) Refer to details of driving drill which need not be considered.

Column Formations.

(17–18.) Formations in column are as follows:—

1.—*Column of subdivisions*, a marching and manœuvring formation which may be used within the zone of fire.

2.—*Quarter-column of sections*, a marching formation on broad roads and

manœuvring formation beyond the zone of fire. In this formation, as in the preceding one, batteries follow one another at a distance of 24 yards (about), wagons follow their respective batteries till the brigade division commander orders the formation of the *brigade division combat échelon*, which takes place 24 yards in rear of the rear battery, each battery now being only followed by its four first line wagons; these wagons may also be formed in a column parallel to the battery if the ground admits of it.

3.—*Battery column.* A parade formation only, guns are at intervals of 10 yards, wagons in rear of their guns, distance between batteries 16 yards.

4.—*Line of columns of subdivisions.* The usual formation of brigade divisions on broken ground to move into position and generally to change position either to the front or rear during an engagement. The interval between the heads of the columns is (about) 170 yards, 77 yards or 38 yards depending upon whether the deployment is to be made at full, half or close interval.

5.—*Line of columns of sections.* The same interval between corresponding subdivisions of each battery as in the line of column of subdivisions.

6.—*Column of reserve.* A formation lending itself particularly well to manœuvre beyond the zone of fire and for the assembly of the brigade division, batteries are in columns of sections, intervals between guns along the whole front of the brigade division uniformly 10 yards.

In the formations, 4, 5 and 6, wagons belonging to combat batteries place themselves in rear of their respective batteries in corresponding formations, the brigade division combat échelon follows some distance in rear.

The remaining paragraphs 19 to 24 deal with the methods of forming column from line and *vice versâ*, which are carried out in a way similar to that for a single battery, the only point to which attention need be drawn is that wagons in action appear to face the rear. In para. 24 it is laid down:—"at the time of deployment, preliminary to the advance into action, the wagons of the combat batteries place themselves in rear of the odd numbered guns of their sections and follow at a distance of about forty yards from the muzzles. When the battery comes into action, the wagons wheel about to the left and halt in rear of the centres of their sections at a distance depending upon local circumstances."

Instructional scheme for the manœuvring and fire discipline of the Brigade Division.

(1, 2 and 3.) In each battery a certain number of gunners are trained as *connecting files*, *scouts* and *observers*, a minimum of two gunners for each of these duties.

The *scouts* must be able to reconnoitre roads and positions from an artillery point of view; they must, therefore, be able to appreciate the practicability of obstacles, to determine their own position (s'orienter), to read maps, they must be intelligent men and good riders.

The *observers* are intended to assist the C.O. in his observation of fire and in the appreciation of the results of changes of object.

Reconnaissance and occupation of positions.

(4.) Except in certain exceptional cases the advance into a position is preceded by a reconnaissance.

(5.) The deployment of the artillery for action from column of route is the most complicated and difficult case, its study comprehends all other cases.

(6.) In this case, as soon as the officer commanding the column has made his general reconnaissance, he orders the advance of the artillery into an *assembling position*, defiladed from view and not far distant from the position

proposed to be occupied by the batteries. These *assembling positions* must, as far as possible, be utilised by the artillery as *preparatory positions.*

When the special reconnaissance of the artillery has been completed, the batteries are ordered up from the assembling position either into a preparatory position or directly into the position for action. In this latter case the brigade division commander gives the necessary orders as to the extent of front to be covered, the first elevation and the position to be occupied by the limbers. Battery commanders lead their battery till there can be no longer any doubt of the line of advance into position, they then rapidly join the brigade division commander to carry out their own reconnaissance.

. . . . . .

(17.) It is now-a-days most important not only to make the reconnaissance of the first position under cover, but to advance under cover and eventually place the batteries on covered positions. The assailant must neglect nothing which may further increase the advantages inherent to the defenders, a delay in opening fire resulting from caution cannot be weighed in the balance with the evils resulting from coming precipitously into action.

Particular attention must be paid to the following points :—

(1.) Advancing the batteries each one in the formation and to the point most likely to keep it under cover, not hesitating for this purpose to make necessary détours.

(2.) Bringing the batteries into action independently.

(3.) Pointing out the target and ranging point to the section commanders and layers before running the guns up into position.

(4.) Running the guns up by hand into the firing position only at the moment of opening fire. A regular disposition of the guns is only a secondary consideration in the choice of each of their positions, which must, above all things, be governed by the ground ; thus a gun may be moved to the front, rear or laterally as much as the equivalent of one third of the interval between two guns, from its normal position.

(18.) The limbers are, as far as possible, placed under cover in any formation most suitable to the particular case and ground ; they must not, however, in any case be more than 220 yards distant from the guns.

(20.) While the fire is proceeding, the brigade division commander makes the necessary dispositions for reconnoitring the ground in front and the second position, which he thinks he will be ordered to take up. With this object in view, besides information gained from the map and his own observation, he makes use of his scouts by sending them to the front on particular missions.

(22.) As soon as the brigade division commander has been warned that a change of position is about to take place, he informs the battery commanders and gives them preliminary instructions, in time for them, without checking the fire, to inform the section commanders, who in their turn warn the layers. The more complete and clear the instructions given before advancing, the more favourable will be the conditions under which the change of position takes place and the less confusion and delay will then be in reopening fire from the second position.

(23.) As soon as the brigade division commander has given the preliminary instructions he proceeds to the second position, battery commanders joining him as soon as they can leave their batteries without danger of delaying the advance.

(24.) As far as the ground will allow, guns are run back by hand before limbering up, so as to conceal this operation as far as possible from the enemy.

(25–26.) The brigade division commander conforms as far as possible to the instructions given for the first case, having regard to further possible changes of position.

(27–28.) In the final stage of the attack, it is the duty of the brigade division commander to send one or two batteries to the immediate support of the infantry without waiting for orders. At this period the objective is known, dispositions made and the crisis follows, now is the opportunity for subordinate commanders to take the initiative. The commanders of the advanced batteries lead their guns as close as possible to the enemy's line, never omitting to take advantage of the lie of the ground. An officer's instinct must be his best guide to further the most sacred duty of war—the co-operation of all arms—at the moment when the infantry is exposed to the most galling fire.

(29.) If the attack has succeeded, batteries which have accompanied the infantry at once proceed, without waiting for the order, to the conquered position, so as to be able to oppose a counter attack or to assist in the pursuit.

(30.) In the *defence*, any available time must be made use of to make a thorough reconnaissance and to carry out other preliminary operations. The brigade division commander studies the probable positions of his opponent and particularly reconnoitres any covered position from which the enemy could take him in flank by indirect fire and must take the ranges to such positions. Equally he must look to means of approach for advancing or retiring to suitable artillery positions. Battery commanders must carefully select and mark out sites for their guns and take steps to cover the front of their batteries with earthworks, beginning by throwing up shelter for the gun numbers, clearing objects which might help the enemy to range and selecting as far as possible covered places for the limbers.

(31.) When retiring, brigade division and battery commanders must always remain with their batteries in the line of fire, leaving the duty of reconnoitring positions in rear to a battery officer.

Fire Discipline.

(32.) The brigade division commander decides the objective assigned to the brigade division amongst his batteries. This division of target is not to be uniform particularly in the artillery duel, it must depend upon what portions can be most distinctly seen or have prominent objects about them which define their position.

In any case the brigade division commander endeavours to concentrate his fire on the most easily seen part of the object, on to other parts of it a relatively feeble fire is directed.

As a rule this concentration of fire is to be attained by diminishing, as far as observation will permit, the extent of front assigned to each battery. If it can be avoided a common object should not be given to two batteries, and under no circumstances to batteries which are not contiguous.

(33.) The brigade division commander gives the signal for the opening of fire and orders the rate of fire.

(34.) Each battery commander regulates the fire of his own battery and ranges for himself, except in the case where contiguous batteries are firing at a common object. One battery is then told off to find the range, but this does not exclude other legitimate proceedings.

A battery which comes into action alongside another battery already engaged

with the intention of firing at the same object accepts the last named battery's elevation for its first elevation.

The brigade division commander personally and by means of his observers observes the fire, but he must avoid giving battery commanders any instructions of the accuracy of which he is not quite certain.

(35.) Changes of object are not to be undertaken, except by order of the brigade division commander, if the new objective is already under fire, reinforcing batteries should fire by salvoes.

(36.) Battery commanders will only change their objective on their own responsibility if the safety of the battery becomes seriously compromised by a body of cavalry or line of skirmishers appearing within close range (say 1100 yards.)

Supply of Ammunition.—Replacing Casualties amongst Men and Horses.

(37.) Brigade division commanders and superior artillery officers are responsible for the supply of ammunition and the replacing of casualties.

NOTE.—Ammunition Columns may be temporarily placed at the disposal of commanders of brigades (6 batteries) and of brigade division commanders.

(38.) After the formation of brigade division combat échelons, battery commanders may no longer dispose of their wagons, except of the four wagons belonging to combat batteries.

(39.) Brigade division commanders and general officers commanding large units of artillery decide on the situations of brigade division combat échelons and of Ammunition Columns, as soon as they have received orders to occupy a position and send orders explaining their situations to officers under their command down to and including battery commanders.

(40.) The position of the brigade division échelon should not be further than 650 yards from the position of the batteries. The position of Ammunition Columns with reference to the brigade division échelons (at a distance of from 2 to $3\frac{1}{2}$ miles) is fixed according to the plan of battle.

(41.) The commanders of brigade division échelons and of Ammunition Columns must not confine themselves to carrying out orders, they must take all necessary measures to ensure their combination with the units to which they belong on their own initiation. In this way alone can the effective supply of ammunition be guaranteed in spite of all inevitable mishaps.

(42.) The commander of the brigade division échelon reports to the brigade division commander as soon as he has arrived at his position.

(43.) The exchange of empty wagons from the batteries for full wagons from the échelon takes place under the orders of the battery commander.

(44.) When empty wagons from the échelon are despatched to the Ammunition Columns to be filled up, a minimum of four wagons is to be sent at a time under the escort of a N.C.O. specially detailed.

(45.) Men and horses to replace casualties are at first to be drawn from the combat battery's wagons until only one man and four horses are left. After this the battery commander demands men and horses from the commander of the échelon, who draws from the *personnel* of the battery reserve. When this reserve is exhausted, casualties are replaced from the whole *personnel* of the échelon till it is exhausted, according to orders given by the brigade division commander.

(46.) The commander of the échelon takes advantage of favourable oppor-

tunities to report to the brigade division commander as to the condition of the échelon in regard to ammunition and spare men and horses.

(47.) The brigade division commander is expected to :—

(i.) Regulate his rate of fire according to the progress of the action and the supply of ammunition.

(ii.) To place his échelon of wagons at the disposal of a battery commander, who may be detached from his brigade division.

(iii.) To provide for the wants of a battery that may not belong to his brigade division but is contiguous to it.

(iv.) To send orders relative to changes of position in time to the commander of the échelon, and if he can manage it to the commander of the Ammunition Column.

(48.) When the commander of an Ammunition Column has arrived on the position which he has been ordered to occupy, he is to send to the officer, under whose orders he has been placed, a connecting file, who will remain near that officer; he is also to take all possible steps to ensure his connection with the brigade division échelons which he will have to supply.

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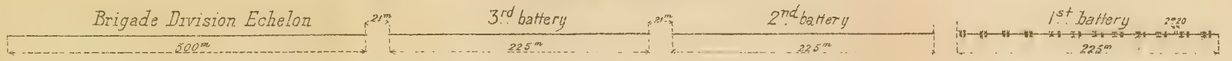
RUSSIA.—FORMATIONS OF BRIGADE DIVISIONS.

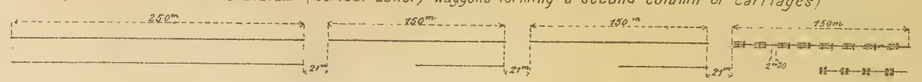
Scale $\frac{1}{4000}$ (1 Metre = 39·37 inches or 1·093 yards)

A. March and Manœuvre Columns.

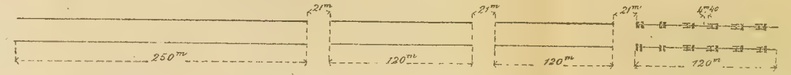
(a) Column of subdivisions



(a) Column of subdivisions *(combat battery waggons forming a second column of carriages)*



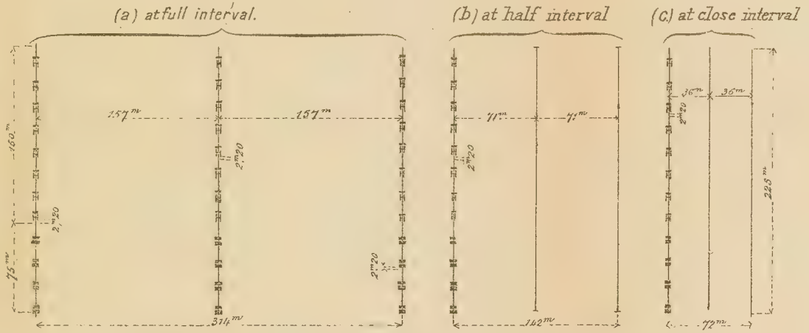
(b) Quarter column of sections.



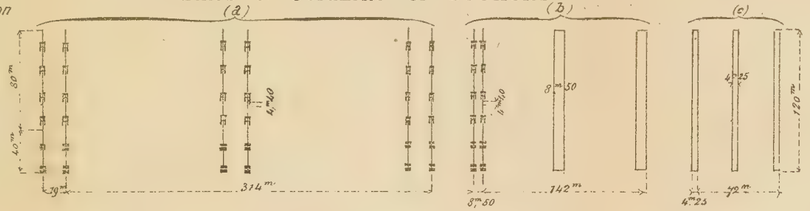
C. Marching formations for the approach to a position.

(Combat batteries)

Lines of columns of subdivisions.

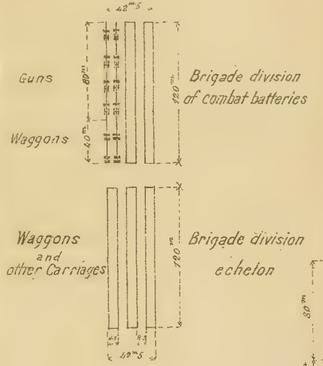


Lines of Columns of Sections



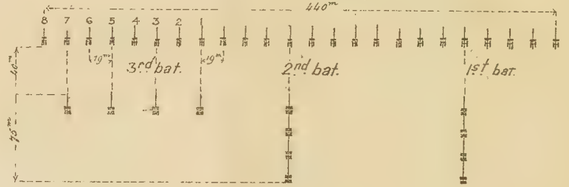
B

Manœuvring formation beyond the zone of fire (Column of reserve or mass)

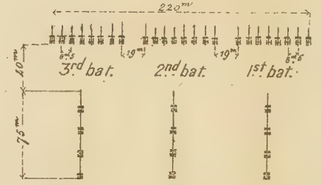


D. Formations for action *(Combat batteries)*

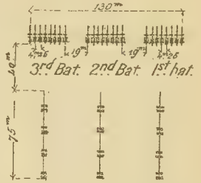
(a) (at full interval)



(b) (at half interval)



(c) (at close interval)



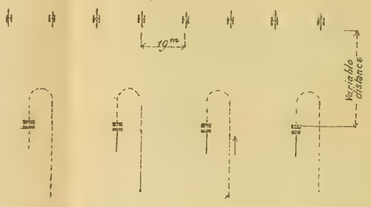
Note.— Before coming into action the column of waggons deploys and each waggon advances in rear of the odd numbered gun of its section. This formation is shown in the plan of the 3rd Battery in the formation at full interval.

E.

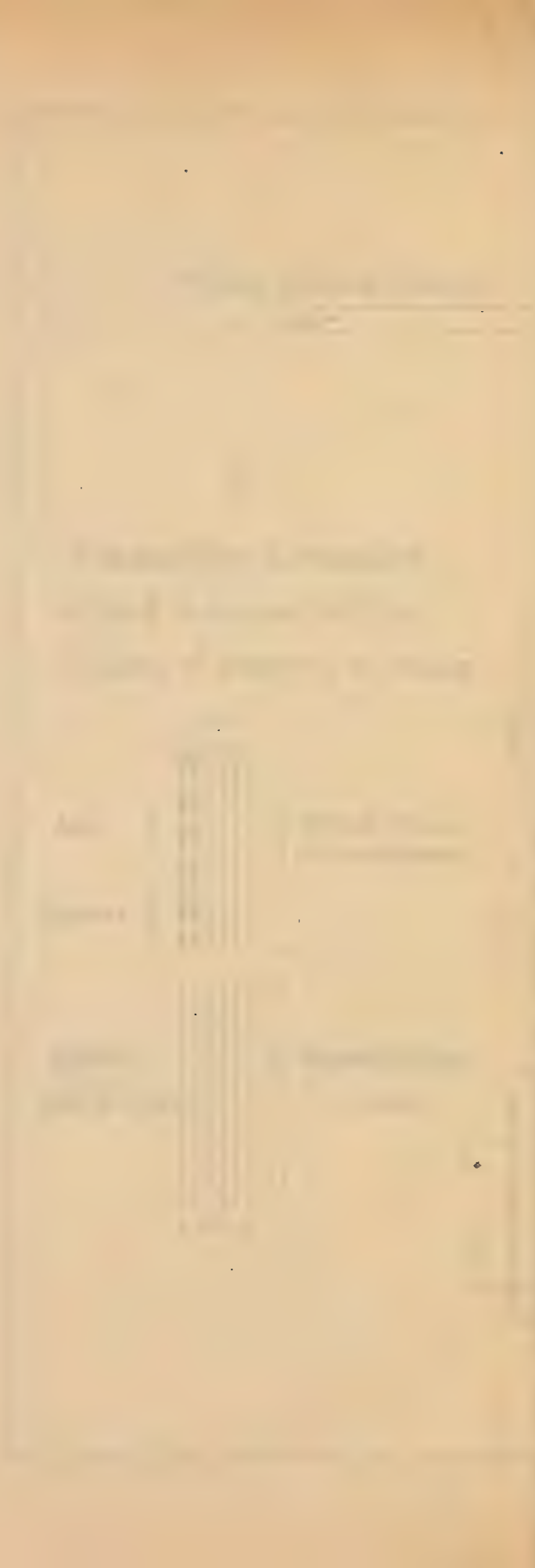
In action at full interval

(usual formation)

$(\frac{1}{2000})$



Note.— The Limbers are under cover waggons proceeding to their position in battery formation by a wheel about to the left.



PRÉCIS

AND

TRANSLATION.

"RUSSIAN ARTILLERY JOURNAL."

AMMUNITION SUPPLY IN THE FIELD.

AN EXTRACT FROM A FRENCH WORK

ON

"ARTILLERY IN CONJUNCTION WITH OTHER ARMS."

BY

MAJOR E. A. LAMBART, R.A.

If we take the times from opening to ceasing fire of German batteries in the affairs of 1870, exclusive of intervals and changes of position, we get the following data :— Probable expenditure in future battles.

Wörth, 6th August.—Fourteen batteries of the V. Corps were engaged, on the average, six hours and expended 5926 projectiles, an average of 423 per battery or more than 70 rounds an hour.

Vionville, 16th August.—Fifteen batteries of III. Corps were in action, on the average, eight hours and expended 11,547 rounds, 769 per battery and over 95 per hour. Eight batteries of X. Corps expended an average of 600 rounds or more than 92 per hour.

Gravelotte, August 18th.—Ninety-three battalions fired 31,684 rounds in five hours or 340 per battery and 75 an hour.

August 31st.—Ten batteries of I. Corps fired 4235 rounds in $3\frac{1}{2}$ hours or over 132 rounds per battery every hour.

Ought we, in reckoning the probable expenditure in future wars, to base our calculations on the expenditure of 1870? We think not—the expenditure will be yet larger, at least as long as ammunition is available. We base our opinion on the following considerations :—

Except at *Wörth*, the Germans were never called on to sustain a serious artillery duel, and they suffered constantly from want of ammunition. At Wörth the batteries began to run short as they crossed the *Sauerbach*. At *Vionville* they suffered from this all day—one battery remained for a long time under fire without replying, having only five rounds a gun left, which were kept as a last reserve.

On August 18th the Guard Artillery was obliged to slacken its fire for fear of running out of action altogether. But such untimely economy of ammunition means a greater expenditure of infantry, and if the losses of the latter exceed a certain limit, which varies very much according to the morale of the troops, defeat is sure to follow.

It is sometimes maintained that in future wars the greater power of the new projectiles will lessen the expenditure of artillery ammunition. This would be

true if other and more weighty causes did not act in the opposite direction. It will be useful to consider this.

At the present day the artillery duel—a struggle to the death between the batteries on either side—is an accepted feature of future battles. This duel will entail a very large expenditure of ammunition—it will not last long, but the fire will be very severe.

The power of firing from behind crests of hills—a result of improved *matériel*—will oblige both sides to take advantage of cover and the zone of ground it will be necessary to search with fire may be very deep, so that to produce the same effect a much larger number of rounds will be required than might be inferred from practice against visible targets on the practice ground.

This heavy expenditure of ammunition will take place at the very beginning of a battle and in a very short time. It is true that four or five well ranged rounds may disable an enemy's battery, but, to arrive at these ranged rounds, it may be necessary to fire 20 or 30 rounds if the enemy has taken proper advantage of cover.

Again, the introduction of smokeless powder for rifles will also tend to an increase in the expenditure of artillery ammunition at this period. Even in the days of black powder, as soon as the infantry opened fire their position was obscured by smoke and the aim of the guns no longer reliable. With the introduction of the new weapons this difficulty of defining the front and depth of the enemy's position will be largely increased. It has often happened in the past that artillery has wasted ammunition on an unoccupied point, how much more frequent will these mistakes be in the future? Yet artillery, at whatever cost of ammunition, must prepare the way for its infantry.

The large increase in the number of intrenching tools carried has given also increased facility to the infantry in taking cover and the power of shrapnel against even slight intrenchments has not increased much since *1870*. Troops of all arms, moreover, have gained great skill in taking advantage of cover.

Lastly, the enormous depth of the masses engaged in firing at each other will prolong the struggle to a degree which we have no possibility of calculating.

We, therefore, are convinced that the expenditure of artillery ammunition in future wars will exceed our very highest anticipation. We must not calculate on a lower figure than 100 rounds an hour per battery. This would mean, in a two-days' battle of *eight* hours fighting each day, 1600 rounds per battery. This need not startle us, as it exactly represents the expenditure in the two-days' battle at Leipsig. But who can say that a battle may not last three, or even four days, and that the expenditure may not reach 500 rounds a gun! This means the contents of 40 ammunition waggons.

These considerations entail the following conclusions: (1.) Artillery must avoid, as far as possible, prolonged combats, must husband its ammunition, expend it only for really important objects and to solve really important tactical problems. (2.) Commanders must most carefully study the service of supply and the serving of an abundant supply of ammunition. All anxiety as to replenishment of ammunition should be removed from those engaged and the supplies should reach them in an unceasing flow, and these supplies should always be prepared as for a battle of great duration.

This may be secured by observing the following principles:—

Uninterrupted supply.

(*a.*) *Forward movement.*—This is synonymous with uninterrupted supply. Our present regulations recognize this as normal as far as ammunition columns-to batteries is concerned, but as exceptional as regards corps parks-to ammunition columns. As regards the grand park sections, these remain on the railways and only exceptionally do they find at the great Etappen stations means of transport by ordinary

roads. They can only supply the batteries by means of the corps parks. Even those sections, which have means of draught, cannot move right up to the batteries because the nature of their waggons will not allow them to go across country. This renders continual forward movement of supply impossible at present, but does not effect the soundness of the principle.

(*b.*) *Abolition of unnecessary transfers of ammunition.*—The more frequent the transfers (repacking) of ammunition, the more difficult it becomes to maintain uninterrupted supply. Yet after unloading the ammunition at the last railway station it is repacked three times, viz.: (1.) From the filled boxes of the grand park to the empty waggons of the corps park. (2.) From the latter to the divisional columns. (3.) From them to the battery waggons. Only the first of them is necessary. The regulations of 1890 direct the interchange of waggons between ammunition columns and batteries, but this has not been carried out on account of the difficulty arising from kits in battery waggons which might go astray. This is an administrative difficulty which might be obviated.

(*c.*) As regards the reloading between the corps park and ammunition columns, this might be avoided by making whole sections of the two interchangeable. As soon as a section of the former is emptied, it should go back to the nearest station of a grand park, and a section of the corps park should move forward to take its place in the ammunition column. The present system has the following disadvantages: (1.) Loss of time in transmitting orders and in collecting the different units of the supply system. (2.) Waste of strength of men and horses from long hours of waiting for orders, etc. (3.) In expectation of orders as to point of reassembly, empty sections remain uselessly near the troops in action; this leads to a dangerous collection of empty carriages in front, whilst fear of jamming the roads keeps the full sections in rear. (4.) To secure connection between the units of supply, all of them should receive the orders of the chief commander, but nothing is less reliable than the simultaneous receipt of orders—any delay in receipt or, worse still, non-receipt of orders may have fatal consequences. If we adopt the principle of interchangeability, any section becomes, in turn, part of an ammunition column and of the corps park. It is simply a train of munitions whose position, as regards the troops, varies according to circumstances.

The orders of the corps commander then need only be confined to giving the direction of supply which, as a rule, will agree with the direction of march of the corps—the supply columns continually moving in this direction must inevitably establish connection with each other if there is an engagement, *i.e.*, if there is a check in front. A change of direction is communicated to the rear portions by orders left at the point of divergence.

(*d.*) *Immediate despatch to the rear of empty waggons.*—This is most important to avoid blocking the roads and to hasten the supply from the rear. As regards the battery waggons, as these are necessary for the rapid transport in action of part of the gun detachments, they must not be sent to the rear immediately they are emptied, and this means leaving empty carriages near the troops engaged—it is an additional reason for the speedy arrival of the supply sections.

(*e.*) *Proximity of the supply units to the combatant troops on line of march.*—This merely represents a return to the principles of Napoleon and is less dangerous now-a-days, as the *personnel* of these units is much more numerous and far better disciplined than in his day.

(*f.*) *Separation of the supply of ammunition from that of material for repairs.*—Parks as at present constituted do not only carry ammunition, but large supplies of materials for repairs, the demand for which is not so unceasing or imperative on the part of the troops. We would, therefore, reorganize the parks into ammunition sections pure and simple and movable workshops and store waggons which need not be nearly so mobile.

The system we propose does not directly depend on the composition of ammunition columns, but the interchangeability of sections of them and sections of the corps park would be more easily arrived at if their composition were alike. This arrangement prevails in Germany, but even the German system does not seem completely satisfactory. The ammunition of the corps park is carried in packing cases carried either in military or requisitioned carriages. It would, in our opinion, facilitate supply if the corps park were divided into two portions: the first of them should be organized similarly to ammunition columns and the ammunition carried in ammunition waggons; the second carrying an equal amount of ammunition, but in ordinary military waggons and in boxes. Lastly, the composition of the 1st echelon of the grand park should be similar to that of the 2nd section of the corps park.

Under this arrangement the work of the parks might be thus detailed:—

The 1st section of the corps park (*a*) moves rapidly forward to the field of battle and, as soon as the ammunition column (*b*) is exhausted, takes its place; the 2nd section (*c*) of the corps park, halted some distance in rear, fills up the empty waggons of the ammunition (*b*) column, which then returns to the troops and takes the place of the 1st (*a*) section of the corps park when that is exhausted.

The movable 1st echelon (*d*) of the grand park, taking part in the general movement, replaces the 2nd section (*c*), the latter having filled up (*b*) moves as rapidly as possible to the immobile echelon (*e*) of the grand park, which is at the unloading station at the railway. This is repeated by (*d*). Thus this system consists in organizing a chain of *light* ammunition columns composed of ammunition waggons and directly supplying the batteries on the field of battle and a chain of heavy military waggons connecting the former with the railway or other base.

We claim for the system the following advantages:—

(*a.*) A larger number of rounds per gun can be carried than by the existing system as shown in this table:—

PRESENT SYSTEM.

	CARRIAGES.	ROUNDS.
Six ammunition columns of 14 ammunition waggons	84	6,300
Corps park	69	5,175
Total	153	11,475
Per gun		106

PROPOSED SYSTEM.

	Carriages.	Rounds.
Six ammunition columns } ammunition waggons }	58	4,350
1st echelon corps park } ammunition waggons }	58	4,350
2nd echelon military } waggons }	37	4,400
Total	153	13,100
Per gun		121

or 90 rounds more per battery.

Moreover, the 58 ammunition waggons of the 1st echelon corps park are quite enough to mount the men when moving at a trot.

(*b.*) There is less danger of jamming the roads as the empty carriages can be sent further to the rear than at present.

(*c.*) The number of carriages of the ammunition columns is diminished 33 per cent.

(*d.*) We avoid reloading—the ammunition is carried up to the light columns in boxes.

(*e.*) In the replenishment from the grand park at the railway, the reloading from the railway waggons into the military waggons can be done much quicker than into ammunition waggons.

(*f.*) The section of the corps park which has military waggons can be used for transport to the front of other supplies besides ammunition if necessary.

Rear service of supply.

The regulations of 1884 lay down that the 1st or mobile echelon of the grand park is within a long day's march or, at most, two days march of the sections of the corps park. Supposing that this 1st echelon marches in the evening of the day of battle, we may expect that the ammunition will reach the batteries on the evening of the following day if the marches are doubled and the repacking is carried out during the halts. The 10 rounds a gun thus brought up are all the batteries can rely on at the end of the 2nd day's fighting. Including case shot, *265* rounds a gun is the total amount available for two days fighting. For a 3rd day's fighting the waggons would be empty, as supplies from the base could only be got up in the very exceptional case of the railway running up into the very centre of operations. We see then how very important it is to make the mobile portions of army parks as large as possible. The use of traction engines for this purpose is often suggested, but a little reflection on the wear and tear of roads in war time will show how unreliable a means of transport they would furnish.

As regards the number of rounds to be carried by the grand park to meet the above-indicated requirements of a possible four-days' battle, *i.e.*, 500 rounds a gun, the grand park should carry about 250 rounds and of these, half should reach the troops in two days and the other half in three days. This is not an exorbitant demand.

Railway echelons.

To avoid delay in supply, it must be arranged that echelons of empty waggons do not have to await the arrival of trains when they reach the railway.

In this connection in laying down the distances between the different train

echelons and the unloading station it will be well to consider an average case of the circumstances affecting them, thus :—

(1.) The battle takes place on the 1st inst. at a place two marches distant from the railway base.

(2.) After midday on that date the empty sections of the ammunition columns commence their movement to the rear, half day's march. On the 2nd they make $1\frac{1}{2}$ marches and at midday reach the station. From this time the echelons of empty waggons arrive in a continual stream.

(3.) A train (1st echelon railway magazine) brings up a supply, the unloading of which into the waggons takes six hours.

(4.) The loading of a train from the magazine (at the base) will also take six hours. Supposing there is no delay in despatch of trains, this train should reach the unloading station at midday on the 2nd.

We suppose also that all the train echelons are warned by telegraph on the night of the 1st that the 2nd train echelon leaves almost immediately, say at 3 a.m. on the 2nd, and the other trains leave one after the other at intervals of six hours and travel at an average of 10 kilometres an hour, we get the following result :—

No. of train magazine.	Date and hour of starting.	Date and hour of arrival.	Time available for unloading at stations.	Possible distance from base station to unloading station.
2nd	3 a.m. 2nd... ...	12 m. 2nd ...	9 hours	90 kilometres.
3rd	9 " "	6 p.m. " ...	9 "	90 "
4th	9 " "	12 " " ...	15 "	150 "
5th	9 " "	6 a.m. 3rd ...	21 "	210 "

In 1870 the distances of the German bases from unloading stations were :—

Army.	Unloading.	Base station.	Distance.
1st ...	Amiens	Soissons	170 kilometres.
2nd ...	Beauvais ...	"	127 "
3rd ...	Troyes	Vitry	177 "
4th ...	Laquy	"	183 "

We have sometimes heard the opinion advanced that there need be no hurry in establishing these base stations on mobilization, as the troops have at their points of concentration supplies of provisions for several weeks; but the case is very different as regards ammunition.

The troops have with them only the amount of ammunition they can carry in their vehicles. Unless the grand park is organized at once on mobilization, it may happen, from the proximity of the points of concentration of two hostile armies, that a great battle may take place before these base stations can be organized. The principal unloading station represents a centre of concentration for supplies and for the regulation of despatch from it—it requires to be established at some large town and, consequently, it cannot move daily in rear of the army. But often nearer the army are to be found stations, not so large, but quite suited

for depôts of supplies. To such a station the 1st echelon of the grand park should be sent forward and, on the eve of a battle, even other echelons. These may be called auxiliary unloading stations.

Office returns to be reduced.

The different echelons of the supply service must comply with requisitions from whatever corps they may come—red-tape regulations must not be allowed, in any case, to cause obstruction. If control is indispensable and must be carried out as far as possible, with regard to expenditure of rations, horses and forage, which may be misapplied, it may become decidedly hurtful when applied to ammunition.

The Germans found in 1866 how harmful this excessive control may be—

"After every affair each battery had, together with an account of the fight, to submit an exact report of its state of ammunition and, in accordance with this report, it received an order on the ammunition column. Although, by the provision of blank forms, labour of writing was diminished as much as possible, it is well known that batteries suffered great inconvenience and were often unable to comply with office rules and requirements when the battle had lasted late into the evening and the troops had to bivouac where they stood and continue their advance next morning" (Hohenlöhe).

Our present regulation lays down—"Every (artillery) unit, as soon as possible after the conclusion of the battle or, at the latest, on the morning of the following day, must send in a report of the numbers required to complete it to its establishment of men, ammunition, etc."

Such detailed reports, taken in connection with the principle of a general replenishment *after* the battle, seem to amount to the very system so forcibly condemned by Prince Hohenlöhe. Report of expenditure of ammunition, when obtainable after a battle, should serve rather as a means of estimating difficulties, but not at all for the framing of orders for the issue of ammunition.

To facilitate supply, the artillery commander of the army corps should periodically, say every hour during the battle, receive information of the expenditure of ammunition, but in round numbers only—so many waggons empty, so many nearly so, so many received from the ammunition column in park. He can then call up from the base (railway) station or its auxiliary station the requisite number of echelons.

Necessity for taking the initiative.

What we call the "elementary" supply of batteries in action, *i.e.*, from their first three waggons, will be exhausted in $2\frac{1}{4}$ hours on the above mentioned basis of expenditure of 100 rounds an hour. The ammunition columns and corps park provide $8\frac{3}{4}$, say nine waggons, per battery, or three echelons. In order that the supply may be uninterrupted (calculating on a rate of movement of $2\frac{1}{2}$ miles per hour), these echelons on the march should be respectively $5\frac{1}{2}$, 11 and 22 miles from the leading battery of the advanced-guard. But the mere length of the column of waggons renders this impossible. The echelons must then seize every chance of advancing at a rapid pace, profiting by the main road being clear or by side roads. The corps park, which by regulation is supposed to be 25–30 miles behind the advanced-troops, must use even greater exertions to get forward. This can only be arrived at by initiative on the part of the commanders of echelons.

The following example shows how little we can rely on keeping communication betweeen the head-quarters and the parks:—

From the 6th–17th August, 1870, the corps park of the Prussian guard was unable to establish communication with its corps. The commander, on arrival at Mainz on the 8th, received no distinct orders as to the direction taken by the troops and from that time he wandered haphazard towards the *W.* till he stumbled on the traces of his corps. He then marched by forced marches to Dieulouard.

On the 18th August, in the heat of the battle, Prince Hohenlöhe was informed that his ammunition column of the guard corps had been exhausted by the III. and X. Corps. Luckily for the Germans the commander of the II. Corps Park of his own initiative had already sent orders to the park to advance from Thiancourt. The distance from there to St. Marie aux Chênes was 19 miles. But the corps park had not even waited for the order to advance.

Two sections advanced straight on the field of battle, forcing their way through the masses of transport waggons, field hospitals, etc. which cumbered the roads and, on the evening of that day, was able to supply each battery with a couple of waggons. The objection to initiative action on the part of commanders of parks is that, to a certain extent, the parks may escape from the control of head-quarters. We suggest below, methods by which this danger may be obviated to a great extent. But we would commence by again insisting on the importance of initiative. When we consider how difficult it is to find subaltern officers who do not fear responsibility and how timidly they exercise the independence entrusted to them, how can we expect to impart the courage of initiative by regulations which are themselves extremely narrow in their wording? Undesirable as we consider it to copy the Germans in all their ideas of the conduct of war, it would, at least, be well to imitate that spirit of independence which is inculcated as a fundamental principle through their whole corps of officers.

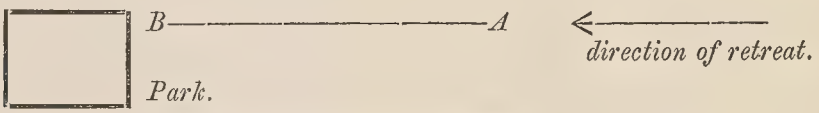
Initiative on the part of commanders of echelons.

The danger of initiative action, as regards the ammunition supply escaping from the control of head-quarters, may lead to the blocking of the roads in case of a retreat. Much of this danger is due to the pernicious habit in military circles of coupling the words "park" and "train." A park in modern days represents a perfectly equipped, organized and disciplined unit capable of manœuvring. Train is, or may be, something quite different.

Let us consider what precautions can be taken by a park commander to avoid any danger of blocking roads in case of a sudden retreat. We must remember that a well equipped park can move rapidly from place to place even at a trot.

Now let L be the length of a column of route of a park and let us take 200 m a minute as the pace of a slow trot, both for the column and for the transmission of orders. We can easily calculate (*see* below) how far the column should send out scouts towards the troops in front so as to avoid delay in case of retreat. This distance is $\frac{2}{3}$ the depth of the column, let us say even $\frac{3}{4}$. This gives us the minimum distance for the park from the *tail of* troops in front.

Calculation—



A = point to which scouts are sent by park.

X = distance from A to B.

$\frac{L}{200}$ = time of movement.

$\frac{X}{200}$ = time for transmission of orders from A to B.

$\frac{X}{80}$ = time required by infantry moving 80 m a minute to get from A to B.

In order that the park may get away before the infantry reach B, we must make—

$$\frac{X}{80} = \frac{X}{200} + \frac{L}{200} \text{ or } X = \frac{2}{3}L$$

The park is supposed to be placed on the edge of the road.

If, at the commencement of a battle the park commander has received no orders, he may, without fear, advance to 2000–3000 m from the tail of the troops.

What action should the park commander take in case of retreat, supposing he gets no orders and cannot communicate with the artillery commander? Let us take two cases.

1st Case.—The General commander after the first collision, for one reason or another, decides to retire. The park commander has approached pretty close to the troops; his park is placed near the roads, generally at cross roads; he has sent out scouts along all the roads at the proper distance; he has left on the line of retreat some orderlies to clear the road to the rear; he is thus ready, in case of necessity, to make a rapid retreat. He hears a weak and intermittent cannonade; he concludes, therefore, that the expenditure of ammunition has not been great. As soon as he receives news of the retreat he starts his waggons at a rapid rate till he has gained several miles from the head of the retreating troops, leaving behind a few waggons to supply them, especially the rear-guard.

2nd Case.—Retreat after an unsuccessful battle. The expenditure will have been very great. The park commander sends to the rear all empty waggons, but retains all the full ones. These allow the columns to pass them and take post between the main body and the rear-guard, for which there is ample space. With these supplies the rear-guard will hold on the more tenaciously, for their supply is better than that of the enemy's advance-guard, which is leaving its supply further behind.

We have taken the extreme case that, up to the end of the battle even, the park commander has received no orders, but even if he has, his general action should be on the same lines. He should not, however, act altogether independently. Should he move his park, he should leave an orderly to receive and follow him with any orders that come.

Scouting.

Every unit of an army has the duty laid on it of clearing its own way when moving. A section of empty waggons moving to the rear may meet a section of the grand park consisting either of military waggons or requisitioned carts. The former section ought to fill up at once from the latter since the latter cannot go up to the fighting line. But this cannot be done at the point of meeting, which might be in a narrow defile. Such unit ought to have scouts a-head of it about $2\frac{1}{2}$ miles and these, when they meet, have ample time to fix a suitable place for the transfer of ammunition.

Initiative of commander of grand park

The duty of foresight and preparation is also incumbent on the commander of the grand park. As soon as it is decided to establish a depôt unloading station, he should set out for the place selected and reconnoitre the line of advance up to the nearest point to the troops so as to select the best places for the replenishment of military supplies.

As soon as he receives information that a battle has commenced, which will probably call for a replenishment of ammunition, he will send forward to each of the selected points a squad under an officer to make all arrangements to expediate the transmission of supplies to the army, to collect forage, etc. Orders for the supply of the different corps issued by head-quarters are sent to one point—the chief depôt—but the points at which the actual replenishment is carried out are further to the front—the Commander-in-Chief may not even know where they are—it is a detail with which he does not concern himself.

The sections of empty waggons will, therefore, have to leave the road they have moved to the rear by at certain points in order to reach the replenishing station

assigned to them (by the commander of the grand park) and at each of these points sign-posts should be put up to show the way.

Lastly, the commander of the grand park prepares in every possible way the despatch of supplies to the front by waggons applying for this purpose to the chief transport officer to organize as much requisitioned transport as possible.

Supplies and lighting.

As a supplementary measure it is advisable to collect supplies and forage for the detachments arriving from the front, not only for the day of arrival, but for their return march which may be through an exhausted country. At all replenishing points very extensive arrangements should be made for lighting platforms, roads and bivouacs. Darkness always means loss of time and causes confusion. It is well to lay stress on the question of light.

NOTES
FROM
CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1896.

THE Subject approved by H.R.H. The Commander-in-Chief for the "Duncan" Gold Medal Prize Essay, 1896, is as follows:—

"Ammunition Columns and Parks, considered with reference to the replacement of ammunition, horses and men during and after an action."

The Rules for the Prize Essays now read:—

The Annual Gold Medal, when awarded, to be accompanied by an *honorarium* of £20; the Silver Medal by an *honorarium* of £10.

The candidates must be Officers of the Regiment who are members of the R.A. Institution.

Officers are requested to confine their Essays to about 16 printed pages of the "Proceedings;" other things being equal brevity will count towards success.

The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each Essay must be *type-written* in triplicate. The Essays must be strictly anonymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the competition has been announced, and he will send the writers the money for their type-writing expenses.

The Committee will allow a sum of £1 for type-writing each Essay.

The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend:—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
3. That no Medal be awarded.

The names of the successful candidates will be announced at the Annual Meeting, and Medallists will be distinguished as such in all Lists, &c., issued from the Institution; and in the event of a University man gaining a Medal, a report of his success will be made to the University of which he may be a member.

The successful Essays will be printed and circulated to members by the Institution.

N.B.—The Committee draw particular attention to the paragraph in the Rules above on the subject of length of Essays; it is not difficult to discover the number of words in an average page of "Proceedings" matter, and so to keep an Essay within the 16 pages' limit.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d.

"The Young Officer's 'Don't,' or Hints to Youngsters on Joining," by an Officer R.A., price 7d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the four examinations ending May 1893:—

Captains (*c*) and (*d*) ... price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

THROUGH confusion in correction of proofs in the paper on "Balaklava" at page 561 of No. 12, Vol. XXII., R.A.I. "Proceedings,"

"I" Troop (now "D")

was printed instead of—

"I" Troop (now "O").

THIS season the Committee of the R.A. Institutions have arranged Lectures for Members and their friends at such large out-stations as are not provided with Military Libraries or Societies.

In this way the following lectures have already been given with most satisfactory results, viz.:—

At Dover, by Major W. D. Conner, R.E., on "Incidents of Bush Warfare."

" " by Dr. T. M. Maguire, LL.D., on "Military Geography of Europe."

" Portsmouth, by Professor C. V. Boys, F.R.S., on "The Photographs of Bullets in Flight."

" Devonport, by Lieut.-Colonel C. M. Watson, C.M.G., R.E., on "The Nile and its Tributaries."

Professor Boys's Lecture at the Portland Hall, Southsea, was honoured by the attendance of the Naval Commander-in-Chief Sir Nowell Salmon, V.C., K.C.B., who was accompanied by the Admiral of the Russian Fleet then in harbour. Besides the information previously given and published Professor Boys very kindly, at the conclusion of his Lecture, offered his opinion of the way in which the problem of photographing heavy projectiles in flight may be solved.

At Dover, Major Conner's Lecture was given in the Banqueting Hall of the Keep specially arranged and lighted for the occasion; a précis of the Lecture and the discussion *in extenso* will shortly be published in the "Proceedings." Dr. Maguire's Lecture was given in the Town Hall and was as keenly appreciated as usual; the Doctor treated the matter generally as at the R.A.I. in 1893 (*see* page 185, No. 4, Vol. XX. R.A.I. "Proceedings") and also gave information on the probable effect of the Kiel Canal and recent manœuvres of Continental Powers, bringing his subject up to date.

The R.A. officers at Devonport availed themselves of the occasion of Lieut.-Colonel Watson's Lecture to ask some 350 of their friends to an "At Home" and to hear him at the Town Hall, Stonehouse; nearly everybody invited came and expressed themselves delighted with the Lecture.

Other Lectures are being arranged for delivery after Christmas, and if they are as well attended and appreciated as those noted above, the Committee will have every reason to congratulate themselves on this new feature in the advantages of the Institution.

It is very gratifying that two out of the first four of this series of Lectures should have been given by Officers of the Royal Engineers.

The following forecast of promotion has been prepared with the assistance of Colonel E. Kensington, late R.A., to whom the thanks of the Regiment are due. Its value will be understood if reference be made to a similar forecast prepared by him in 1890; he there says that, in 1895, promotion to Major should include Captain Nelson and to Captain Lieutenant Glanville—at the time of writing Major Nelson is the last Major but one on the list having been promoted on the 11th November, and Lieutenant Glanville is 3rd for promotion so that his rank as Captain will probably bear some date in December.

The results as worked out below show that before long promotion in every rank of the Royal Artillery will compare unfavourably with that of the Indian Staff Corps.

PROMOTION.

	Major to Lieut.-Colonel.	Captain to Major.	Lieutenant to Captain.	Remarks.
1896	Perrott.	McLeod.	Butler.	
1897	Lane.	Oldfield.	Chepmell.	
1898	Wodehouse.	Balguy.	Matthews.	
1899	Ward.	P. J. Crampton.	Laird.	
1900	Hopkins.	Brook-Smith.	Parker.	
1901	Purvis.	Rodwell.	Templer.	
1902	Howard.	Harrison.	Gray.	Major R. M. Crofton retires for age.
1903	Eardley-Wilmot.	Dodgson.	Slater.	Major G. N. H. Barlow retires for age.
1904	Inglis.	Graham.	Bridges and Robinson.	

Subalterns will serve for 13 years but the rate will improve about 1906.

Captains will serve for 21 years.

Majors will serve for 27½ years and the rate will probably get worse.

The above forecast is based on a supposition that about the same number of Lieut.-Colonels as now are always to be extra regimentally employed and that casualties will occur in the same proportion per cent. as they have in the last five years.

OBITUARY.

MAJOR-GENERAL E. Atlay, C B. (retired), who died at Lausanne, France, on 1st December, 1895, joined the Bengal Artillery as 2nd Lieutenant, 30th January, 1842; became 1st Lieutenant, 3rd July, 1845; Captain, 30th May, 1857; Lieut.-Colonel, 24th March, 1865; Colonel, 24th March, 1870; and retired on full pay with the hon. rank of Major-General, 1st August, 1872. Major-General Atlay served in the Sutlej campaign of 1845-46, including the battles of Moodkee, Ferozeshah (wounded), and Sobraon, and the reduction of the Fort of Kot Kangra (medal and two clasps). Punjab campaign 1848-49 (medal). Commanded a battery of Horse Artillery against the Mohmunds in the Peshawar Valley in December, 1863, and the Royal Artillery with the Hazara Field Force in 1868 (medal, with clasp, and C.B.).

THE sad news of the death of Major H. M. Sandbach at Aden has called forth expressions of regret from every portion of the Regiment: a thorough soldier, a man of sound judgment, well known in India and at home, popular both in the service and society, his loss causes a gap in the Regiment very difficult to fill. He died on 6th December, 1895, from wounds inflicted by a lioness whilst shooting in Somaliland; he was commissioned as Lieutenant, 14th August, 1876; became Captain, 13th March, 1885; and Major, 4th January, 1894. Major Sandbach served in the Afghan War, 1878–80, and was present at the action of Shekabad, actions near Kabul, and battle of Charasiah; (despatches, *London Gazette*, 30th July, 1880; medal with clasp). Soudan Expedition, 1885. Battle of Suakin, reconnaissance towards and advance on Hasheen, action at Hasheen, advance on 22nd March in support and occupation of Tofrek zereba, advance on Tamai, and burning of Hasheen village; (medal with clasp; bronze star).

LIEUT.-COLONEL E. W. NASH (retired) died at Winfrith Rectory, Dorset on the 16th December, 1895. He joined the Regiment as Lieutenant, 18th December, 1861; became Captain, 16th January, 1875; Major, 24th June, 1882; Lieut.-Colonel, 29th March, 1890; and retired on retired pay, 3rd January, 1894.

NOTES

FROM

CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1896.

THE Subject approved by H.R.H. The Commander-in-Chief for the "Duncan" Gold Medal Prize Essay, 1896, is as follows:—

"Ammunition Columns and Parks, considered with reference to the replacement of ammunition, horses and men during and after an action."

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The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each Essay must be *type-written* in triplicate. The Essays must be strictly anonymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

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The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend:—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
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THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d.

"The Young Officer's 'Don't,' or Hints to Youngsters on Joining," by an Officer R.A., price 7d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the four examinations ending May 1893:—

Captains (*c*) and (*d*) ... price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

WOOLWICH.

REGIMENTAL CRICKET IN 1895.

THINKING that some little account of Regimental cricket affairs may be of some general interest, we have prepared tables, showing batting and bowling averages, and have put together a few remarks about our doings.

The programme consisted of 13 matches, of which those against Eton Ramblers, Royal Engineers (one match), Yorkshire Gentlemen, Household Brigade, Harlequins, and I. Zingari were won; those against Quidnuncs, Gentlemen of M.C.C. and Free Foresters were lost; whilst those against Aldershot Division, Royal Engineers (one match), and Band of Brothers were drawn. The Greenjacket match, to our general regret, fell through, as the Riflemen were unable just then to get together an XI. Altogether, therefore, we may claim to have had a good season.

The result of our match at Lords was a disappointment. We were fairly beaten, but did not do ourselves justice. Of a good team Perkins alone was in form, and he did brilliantly. We must hope for better luck next time.

A matter of satisfaction was the success of our bowlers. Holloway, Kirke, Waymouth and Moorhouse bearing the brunt of the work. We may specially mention Moorhouse's performance against the Band of Brothers, and Kirke's in the 2nd innings of the I. Zingari match. Kirke is just the sort of bowler we want (slow, left hand). Holloway and Waymouth were both consistently good throughout the season. Gunner Butler, too, at times was useful.

As to the batting, Wynne, Straubenzee and Curteis played with marked success all through the season; whilst Strong and Foster (when we were lucky enough to get them) were most valuable.

Among many good performances we may single out two, Wynne's 142 (not out) against the Aldershot Division, and Straubenzee's 102 against the Household Brigade. The former saved us from what looked likely to be an ignominious defeat, and the latter turned a doubtful result into a victory.

We were unlucky in never succeeding in getting the services of Hine-Haycock and the two Hamiltons ("R.S." and "P.D.")

The fielding, all round, was up to the mark. Craig was excellent in the out-field and brought off some good catches.

Cricketers from out-stations were most kind in putting themselves to inconvenience to come and play and we may fairly claim that our teams were representative ones. The Shoebury players, on more than one occasion, gave up their own matches to "come over and help us"—and such disinterested support is sure to make Regimental cricket a continued success.

Since last season our turf has been re-laid—the R.A. Games' Fund generously subscribing £40—and we confidently hope for improved wickets.

We are taking steps to put the Pavilion in thorough repair. This is much needed.

The hon. sec. has to thank Majors Abdy and Curteis for the benefit of their experience in conducting the club affairs, and also thanks our "Gallery" for their presence, under conditions which are not altogether pleasant in our climate.

Our programme for next season will follow the usual lines, but we are to have a new match at Linton Park on July 15–16, thanks to a very kind invitation from Mr. Cornwallis.

Batting Averages.

Names.	No. of Innings.	Times not out	Total Runs.	Highest in match.	Highest in innings.	Average.
Captain J. G. Wynne...	13	1	419	176	142*	34·9
C. C. Van-Straubenzee	20	0	545	161	102	27·25
W. L. Foster	6	0	154	91	75	25·6
Major F. A. Curteis	18	1	432	105	74	25·4
Captain P. H. M. Dorehill	7	0	130	68	68	18·5
Captain A. E. J. Perkins	13	1	213	52*	52*	17·7
Captain H. R. Adair	15	2	143	62	57	11
R. A. Craig	7	0	73	29	29	10·4
F. H. Stanton	10	0	194	45	39	10·4
W. O. Holloway	10	1	91	33	29*	10·1
K. St. G. Kirke	5	1	35	16	16*	8·7
E. G. Waymouth	8	1	59	11	11	8·4
Gunner Butler	10	2	58	14	14	7·3
H. C. Moorhouse	7	1	44	43	24*	7·3

* Signifies not out.

Elwes and Budworth both played against Aldershot Division.

Following played in 4 innings and under :—

Names.					
W. Strong	4	1	121	83	72	40·3
R. P. Benson	2	1	33	33	17*	33
J. M. Macgowan	4	2	56	41	28*	28
R. A. Birley...	4	1	73	42	36*	24·3
L. K. Stanbrough	1	0	17	17	17	17
Captain Cooper	3	0	35	30	30	11·6
B. Atkinson	1	0	8	8	8	8
Captain Crampton	2	1	9	9	9	9
Captain Handley	2	0	15	15	12	7·5
Major Davidson	2	0	11	11	11	5·5
N. E. Bellairs	2	0	12	12	12	6
Major Abdy...	3	0	19	11	11	6·3
Captain Quinton	4	0	18	11	7	4·5
E. J. R. Peel	2	0	8	8	7	4
Major LLoyd	2	0	4	4	2	2
Captain de Rougemont	2	0	52	52	36	26
E. Waters	1	0	17	17	17	17

* Signifies not out.

Bowling Averages. (Only kept for some of the matches.)

Names.	Wides.	No-balls.	Runs.	Wkts.	Maidens.	Overs.	Average.
W. O. Holloway	—	—	259	24	33	110	10·8
K. St. G. Kirke	—	—	155	13	33	97	11·9
E. G. Waymouth	—	2	207	15	23	83	13·8
H. C. Moorhouse	—	—	325	20	17	109	16·2
B. W. Holman	—	—	139	8	8	44	17·4
Captain A. E. J. Perkins ...	1	—	36	2	0	10	18
Gunner Butler	1	—	318	17	41	138	18·7
C. C. Van-Straubenzee ...	—	—	56	2	3	20	28
Captain Adair	—	—	87	3	0	42	29

Also bowled in 2 innings or less :—

Names.	Wides.	Wkts.	Runs.	Maidens.	Overs.	Average.
F. H. Stanton	—	1	11	2	4	11
Captain Handley	—	—	5	0	3	3
Captain Benson	1	4	61	7	24	15·2
Captain Crampton	—	—	48	0	14	—
L. K. Stanbrough	—	—	27	0	5	—
Bombardier Osmonde	—	—	18	0	3	—
Captain Dorehill	—	—	35	0	6	—
Major Curteis	—	—	13	0	2	—
J. E. Cairnes	—	—	65	3	24	—
Sergeant-Major Cochrane	—	—	14	3	6	—
Captain Wynne	—	1	13	0	3	13

The following gives the total number of wickets obtained by bowlers throughout the season in all R.A. Matches—

W. O. Holloway	38	wickets.
E. G. Waymouth	35	"
Gunner Butler	35	"
H. C. Moorhouse	20	"
K. St. G. Kirke	17	"
C. C. Van-Straubenzee	10	"
Captain Adair	7	"
J. M. Macgowan	6	"
N. E. Bellairs	5	"

PLYMOUTH.

THERE is no intention to perpetrate a joke, but the present weather would damp the spirits of the most energetic officers. The barometer may show what it likes but the practical record is three fine days since the 14th November. Christmas week has been an intermittent deluge. So much for the weather.

The Regiment is doing fairly well in football; indeed, 15 Western has one of the leading teams in the "league" matches. This is in a great measure due to the play of both the full backs (rumour says that one is a professional). It is a pity that more of the young officers do not play. Lieutenants Hanna and Westropp are the chief exponents of the game among the officers.

To those who know the neighbourhood there are few more charming spots than the moors above Tavistock. There is situated an excellent golf club, which is most generous to officers of both services, so that golf, which in many places is rapidly becoming an expensive luxury, is here a cheap amusement. Nearly all the officers R.A. are members, and this is probably the reason which led Col. Dalton to present a handsome cup to the head-quarter Mess to be competed for annually.

The day of competition was unfortunately of the very worst, yet some good scores were handed in. Major Mansel, the winner, almost reached his best form —93. Major Haines, Captains Mostyn, Molesworth, Robinson and Callwell, and Lieutenants Westropp, Scott, Belcher, Chamier, Disney-Roebuck, and Riach were among the competitors. Had it not been the leave season, this creditable number would have been considerably increased.

Our friends at Weedon and Newbridge might look with disdain upon hunting in this district—chiefly moor and woodland, but we have our good days, notably "Boxing-day" when there was a good old-fashioned long hunting run of over 2 hours, with the Dartmoors in a rideable banking country, in which the gunners were well to the fore.

Major Hickman and the officers 15 Western gave a most enjoyable little dance at Fort Efford lately. The Mess establishment and officers' quarters were completely metamorphosed by tasteful decorations and the result was eminently successful. But we do not live for amusement entirely.

A lecture upon the "Nile and its Tributaries" by Colonel Watson, C.M.G., R.E., arranged by the R.A. Institution, was largely attended. The officers R.A. were "At Home" and gave tea to all comers.

Numerous officers, including General Sir F. Forestier-Walker, Colonel Walkey, R.A., etc., were present at Colonel Dalton's able lecture, on "The Battle of Austerlitz."

There are few changes in the garrison. The Sierra Leone detachment with Captain Norwood and Lieutenant Curme proceeded to Sierra Leone on the outbreak of hostilities with Ashantee. We take this opportunity of thanking Lord Mount Edgcumbe on behalf of the Regiment for his hospitality. A magnificent supper, including all the luxuries dear to the heart of "Tommy," was provided by him for the detachment the night before its departure and was served by his own servants. There was in the profusion a pheasant to every two men.

Thanks to the energetic exertions of Major and Mrs. Perrott a comfortable recreation room has been erected at Maker, which is a great boon to the Western Section (or the part of it there stationed).

Lieutenant Walker took a draft to Halifax, where he experienced the hospitality of the regimental Mess there, and of Colonel Anstruther, who was most kind; he also brought a draft back.

Captain Carleton is taking a draft round the West Indies. We regret to hear that he is in quarantine off St. Lucia.

Captains Callwell and Robinson with Lieutenant Westropp are tobogganing at Davos Platz.

OBITUARY.

Major-General Hon. A. Stewart (retired), died in London on 7th January, 1896. He was first commissioned as Lieut. 21st June, 1856; became 2nd Capt. 6th July, 1867; Capt. 5th July, 1872; Major 22nd Sept., 1875; Lieut.-Col. 22nd Nov., 1879; Col. 22nd Nov., 1883, and retired on retired pay, with the hon. rank of Major-General 29th Dec., 1883. Major-General Stewart served during the China War of 1860, and was present at Sinho, Tangku, the actions near Tangchow, and the surrender of Pekin. (Medal with clasp.) In the Afghan campaign of 1870-80, he was present at the affairs of Futtehabad and on the Gara Heights, near Kam Dakka, (despatches, brevet of Lieut.-Col., medal.) He was A.D.C. to the Governors-General of India, Earls Canning, Elgin and Mayo, from 1861-1872.

Captain J. L. F. Shepherd, died at Grayshott Hall, Hants, on 19th January, 1896, from the effects of an accident whilst hunting. He joined the Regiment as Lieut., 14th February, 1883, and became Capt., 6th February, 1892.

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BOOKS RECOMMENDED FOR THE PROMOTION AND STAFF COLLEGE EXAMINATIONS.

BY

LIEUT.-COLONEL EDEN BAKER, R.A.

[*Always closely follow the Syllabus in the Queen's Regulations.*]

MILITARY LAW.

LIEUTENANTS.—Army Annual Act, 1895.
Manual of Military Law, 1894.—Army Act. Parts I., II., and V. (Sections 175 to 184 and 190). Rules of Procedure.
Queen's Regulations, 1895. Sections VI., XIX. and XXII.
Military Law, by Lieut.-Col. S. C. Pratt. 9th Edition, 1895.
Military Law Examiner by Lieut.-Col. S. C. Pratt, 1895.

CAPTAINS, IN ADDITION TO THE ABOVE :—
Manual of Military Law, 1894.—Army Act. Parts III., IV., and V. (Sections 185 to 189), and Schedules.

FIELD FORTIFICATION.

Instruction in Military Engineering. Part I., Field Defences 1892 (*omit* fougasses and large inundations.)

Manual of Military Engineering, 1893, (*omit* Sections 11 12, 17 and 20).
For Staff College.—Field Works by Col. C. B. Brackenbury, R.A.

MILITARY TOPOGRAPHY.

Text-book of Military Topography, 1888 (*omit* pages 110 to 158, and 181 to 227).

TACTICS.

Infantry Drill, 1893. *Read* the tactical part on pages xxiv, xxvi, 11, 50 51, 87, 90, 94 to 192, 244 to 249.
Précis of Modern Tactics by Home-Pratt.
Minor Tactics by Colonel Clery. 12th Edition. *Omit* examples except for the Staff College Examination.

Field Artillery, by Pratt-Baker, 1896. The tactical portion only.

ARTILLERY.—*Lieutenants R.A. only.*

Text-book of Gunnery, 1887. Chapters I., II., XII., XIV., and XVII. (A new Edition is in the Press).
Treatise on Service Ordnance, 1893.
Treatise on Military Carriages, 1895.
Treatise on Ammunition, 1892. (A new Edition is in the Press).
Regulations for Magazines, &c., 1894. Also see Amendments published with Army Orders, 20th January, 1896.
Manual of Field Range-finding, 1890.
Hand-book for the Depression Range-finder, 1895. } Alternative.
Musketry Instruction, 1894. The Mekometer, p. 136.
Field Artillery Drill, 1893. For Horse and Field Batteries only.
Garrison Artillery Drill, Vol. I., 1895; Vol. II., 1891. } For Garrison
Siege Artillery Drill, 1891. } Artillery only.
Field Artillery Service Handbook, 1896. (Now in the Press).
Handbook for Telescopic Sights, Land Service, 1894.

MILITARY ADMINISTRATION.—*Staff College and (g).*

The Army Book for the British Empire.

MILITARY HISTORY.—*Staff College only.*

Vide Army Order 72, May, 1894, and Army Order 185, November, 1895.
Précis of the Franco-German War by Pratt, published by the R.A. Institution.

ARTILLERY.—*Volunteer Officers (Captains and Lieutenants).*

Official Handbooks of Guns on which examined.
Field Artillery Drill, 1893.
Garrison Artillery Drill, Vol. I., 1895; Vol. II., 1891.
Handbook of Artillery *Matériel*, by Lieut.-Col. Morgan.

Officers going up for the Staff College Examination are recommended to read all Magazine Articles, Lectures, &c., that refer to Field Subjects.

ARTILLERY COLLEGE, WOOLWICH,
March, 1896.

THE ROYAL ARTILLERY MEETING, 1896,

WILL TAKE PLACE AT

ALDERSHOT

ON

SATURDAY, APRIL 18TH.

BY PERMISSION OF

General H.R.H. the DUKE of CONNAUGHT, K.G., K.C.B., &c., &c.
Commanding Aldershot Division.

(UNDER NATIONAL HUNT RULES).

STEWARDS:

MAJOR-GENERAL J. ALLEYNE, C.B., R.A.
COLONEL R. H. WALLACE, R.H.A.
MAJOR F. W. J. EUSTACE, R.H.A.
MAJOR A. H. CARTER, R.A.
CAPTAIN C. F. BLANE, R.H.A.
LIEUTENANT H. L. POWELL, R.H.A.

Clerk of the Course & Stakeholder ... LIEUT.-COLONEL S. H. TOOGOOD,
Clerk of the Scales, Judge and Handicapper ... ... MR. E. S. BROWN,
Starter ... ... LIEUT.-COLONEL B. GOUGH, 9th Lancers.

R.A. REGIMENTAL RACES.

***No Officer will be qualified to enter or ride horses in the regimental races who is not a subscriber of at least 1 sov. to the Race-fund.

The Royal Artillery Gold Cup value **100** sovs., with **50** sovs. to the winner, **20** sovs. to the second, and **10** sovs. to the third; for horses, the property of, and to be ridden by, Officers on full or half-pay of the Royal Artillery, that have never won a steeplechase value 90 sovs., and have been regularly hunted during the past season by their nominators or by some other Officer qualified to enter; 12 st. each; the winner of a steeplechase under 50 sovs. in value to carry 7 lb. extra, of two or more such races, or of one or more steeplechase value 50 sovs. to carry 14 lb. extra; no penalties for winners of regimental races; entrance 2 sovs., but starters free except the winner; three miles.

Ten entries or the race may be declared void.

To close on Tuesday, March 31st, to Messrs. Wetherby, Messrs. Pratt & Co., or Colonel Toogood, Denham Court, Winchester.

The Welter Steeplechase of **50** sovs., with **10** sovs. to the second, and **5** sovs. to the third; for horses (not thoroughbred), the property of, and to be ridden by, Officers on full or half-pay of the Royal Artillery, or Officers who have retired from the Regiment, which have been regularly hunted during the past season by their nominators, or by some other Officer qualified to enter, and have never won a race of any description; 13 st. 7 lb. each; horses not ridden by their owners to carry 7 lb. extra; entrance 1 sov., but starters free except the winner; two miles and five furlongs.

Ten entries, or the race may be declared void.

To close as above on Tuesday, March 31st.

The Light Weight Steeplechase of **50** sovs., with **10** sovs. to the

second, and 5 sovs. to the third; for horses (not thoroughbred) the property of, and to be ridden by, Officers on full or half-pay of the Royal Artillery, which have been regularly hunted during the past season by their nominators or by some other Officer qualified to enter, and have never won a race of any description; 11 st. 7 lb. each; horses not ridden by their owners to carry 7 lb. extra; entrance 1 sov., but starters free except the winner; two miles and five furlongs.

Ten entries or the race may be declared void.

To close as above on Tuesday, March 31st.

***In the above three races, the Stewards reserve to themselves the right to refuse the entry of any horse that, in their opinion, has not been regularly and fairly hunted.

A Consolation Steeplechase of **25** sovs. for beaten horses in the regimental races; the second to receive 4 sovs. out of the race; 12 st. each; post entrance 1 sov.; two miles.

Two Open Military Races.

The attention of officers entering horses is specially called to Part IX. of the National Hunt Rules, non-compliance with which may lead to disqualification. The age of horses must in all cases be given, those more than six being described as aged. If the sire and dam are unknown, it is best to say "pedigree unknown," and then add where, when, and from whom purchased. As entries made beforehand can now be withdrawn up to the time of closing, officers who are uncertain as to the formality of their entries, should send them in sufficient time to enable the Secretary to return them for correction if necessary. Entries made by telegram must give the full description, age, &c. as fully as those made in writing.

CONDITIONS.

1. The whole of the added money will be given for two starters, but one half only for a walk over.
2. Fees as allowed by Rule.
3. Colours not registered must be declared at time of entry, or to Messrs. Pratt & Co., 9, George Street, Hanover Square, London, W., by twelve o'clock noon the day before running.

STABLING AT ALDERSHOT.

There are good loose boxes at the Farnborough Commission Stables, adjoining the Queen's Hotel, North Camp, Farnborough, for which application should be made to the Manager. (Telegraphic address, "Spurs, Farnborough, Hants").

The charge will be 10s. per day of 24 hours, to include corn, hay, straw and every requisite; or 5s. only if horses do not stop the night.

Farnborough, on the S.W. Railway, is the nearest station to these stables.

GIBRALTAR.

The first of what it is hoped may be a series of annual R.A. pantomimes took place at Gibraltar this year at the beginning of January and proved completely successful.

The pantomime selected was that by H. J. Byron, entitled "Aladdin or the Wonderful Scamp," into which many topical and local allusions were written and several up-to-date dances and songs introduced.

One great feature of the entertainment was the beauty and finish of the dresses and make-ups which were furnished partly by Clarkson of London and partly by Mr. Nannia of local fame. Another very popular feature were the children's

ballets, danced by the children of the R.A. schools, assisted by a few of other regiments and arranged by Señor Tardio.

Part of the scenery was specially painted for the occasion by Gunner Winkelsett, R.A., who also arranged the harlequinade and took the part of clown in it and of "Genius of the Ring" in the pantomime itself.

The first scene was laid in St. Michael's Cave, so well known to inhabitants of Gibraltar, and throughout the play constant allusions to Gibraltar topics amused and interested the crowded audiences.

It is impossible to refer to the many scenes through which the action of the play runs, many of them admirably set, nor to speak of all the performers who won applause, but special mention must be made of some.

The part of Alladin was exceedingly well played by Miss A. Craig, whose singing, dancing and acting were equally good and who appeared quite at home upon the stage. Her sister, Miss B. Craig, took the part of the Slave of the Lamp, and Miss Dougherty that of the Princess, and both did their best for the success of the piece. As Emperor of China Lieutenant Forman, whose get up was excellent, performed exceedingly well and thoroughly filled the part. Lieutenant McCheane had scarcely so many opportunities of distinction as Pekoe, but his singing and dancing were very good. The comic element, which was very strong, was supplied by Lieutenants Cooper and Hunter, the former as the Vizier, the latter as the Widow Twankay, Aladdin's mother. Mr. Cooper, who has never in our opinion acted so well, quite excelled himself, and in conjunction with Mr. Hunter repeatedly brought down the house. The last-named, whose low comedy qualities are well known and much appreciated in Gibraltar, was most droll throughout, whether in his first scene as the inevitable Trilby or in his later scenes. We have already mentioned Gunner Winkelsett, but more than a word of praise must be accorded to Gunner Guy who is a capable actor and gave a spirited impersonation of the magician.

The mandarins, maidens and demons were adequately represented by Royal Artillery performers, and when we have mentioned an excellent Spanish dance performed with great effect by Mr. and Miss Artesani, and have noticed the capital performance of an orchestra led by Mr. Weber, R.A., we have mentioned all the most noteworthy performers in the R.A. Pantomime of 1896; played to large audiences for three evening performances and one matinée it is satisfactory to record that it was financially a success and it is hoped the forerunner of many similar performances,

The chief credit of the whole is due to the managing committee consisting of Lieutenants Forman, Hunter and McCheane.

CHARACTERS:

The Emperor of China	Lieut. Forman, R.A.
The Vizier...	Lieut. Cooper, R.A.
Pekoe	Lieut. McCheane, R.A.
Aladdin	Miss A. Craig.
Abanazar	Gr. Guy, R.A.
Te-To-Tum	T. Wallington.
The Slave of the Lamp	Miss B. Craig.
The Genius of the Ring	Gr. Winklesett, R.A.
The Widow Twankay	Lieut. Hunter, R.A.
Princess Badroulboudour	Miss Dougherty.

Mandarins. Maidens. Demons. Chinamen.

Committee of management.	General Manager ...	Lieut. Forman, R.A.
	Property Manager ...	Lieut. Hunter, R.A.
	Stage Manager... ...	Lieut. McCheane, R.A.

OBITUARY.

Major-General H. Chichester (retired) died at Barnstaple on 28th January, 1896. He entered the Bengal Artillery as 2nd Lieutenant, 13th June, 1856; became Lieutenant, 27th April, 1858; Captain, 24th March, 1865; Major, 23rd November, 1872; Lieut.-Colonel, 26th May, 1880; Colonel, 26th May, 1884, and retired with the hon. rank of Major-General, 9th December, 1886. Major-General Chichester served in the Indian Mutiny, 1857–58, and was present at the actions on the Hindun, battle of Budleekeserai, siege of Delhi, and battle of Bareilly, Despatches, *London Gazette*, 30th March, 1858, (medal with clasp.)

Major-General C. V. Cockburn (retired), who died in London on 5th February, 1896, joined the Regiment as 2nd Lieutenant, 6th November, 1830; became Lieutenant, 6th February, 1832; 2nd Captain, 13th April, 1842; Captain, 9th November, 1846; Brevet-Major and Lieut.-Colonel, 20th June, 1854; Colonel, 20th September, 1857, and retired on full pay with the hon. rank of Major-General, 6th July, 1867.

Lieut.-Colonel A. W. Duncan (retired), whose death occurred in Edinburgh on 6th February, 1896, was first commissioned as Lieutenant, 7th April, 1856; became Captain, 29th August, 1866; Major, 1st April, 1874, and retired on a pension with the hon. rank of Lieut.-Colonel, 1st March, 1880.

Major-General H. T. Molesworth (retired) died at Bideford on 27th January, 1896. He joined the Madras Artillery as 2nd Lieutenant, 10th December, 1839; became Lieutenant, 21st December, 1841; Captain, 10th December, 1854; Major, 10th June, 1863; Lieut.-Colonel, 16th July, 1863; Colonel, 16th July, 1868, and retired on full pay with the hon. rank of Major-General, 1st August, 1872. Major-General Molesworth served with the China expedition, 1841–42, and was present at Canton, the capture of Amoy, Chusan, Chinhae, Ningpo, Chapoo, Woosung, Shanghai, and Chin Kiang Foo, and landing before Nankin (medal).

DIARY OF FIXTURES.

MARCH.

Day of the Mth	Wk.	Regimental.	Cricket, &c,	Private.
1	**S**	... ...	... ...	... ...
2	M	... ...	... ...	... ...
3	T	... ...	... ...	... ...
4	W	R.A. Band Concert at 9 p.m.	... ...	... ...
5	Th	... ...	... ...	... ...
6	F	... ...	Grand Military.	... ...
7	S	... ...	Grand Military.	... ...
8	**S**	... ...	... ...	... ...
9	M	... ...	... ...	'Ubique' Royal Arch Chapter meets at "Criterion."
10	T	... ...	... ...	... ...
11	W	R. A. Band Concert at 3 p.m.	... ...	... ...
12	Th	... ...	... ...	... ...
13	F	... ...	... ...	... ...
14	S	... ...	... ...	... ...
15	**S**	... ...	... ...	... ...
16	M	... ...	... ...	... ...
17	T	... ...	... ...	... ...
18	W	R.A. Band Concert at 3 p.m.	... ...	... ...
19	Th	... ...	... ...	... ...
20	F	... ...	... ...	... ...
21	S	... ...	... ...	... ...
22	**S**	... ...	... ...	... ...
23	M	... ...	... ...	... ...
24	T	... ...	... ...	... ...
25	W	R.A. Band Concert at 3 p.m.	... ...	... ...
26	Th	... ...	Liverpool Races begin.	... ...
27	F	R.A. Band Concert Queen's Hall at 3 p.m.	Grand National.	... ...
28	S	... ...	... ...	... ...
29	**S**	... ...	... ...	... ...
30	M	... ...	R.A. *v.* R.E., Rackets and Billiards at Chatham.	... ...
31	T	... ...	R.A. *v.* R.E., Rackets and Billiards at Chatham.	... ...

APRIL.

1	W	... ...	... ...	... ...
2	Th	... ...	... ...	... ...
3	F	Good Friday.	... ...	... ...
4	S	... ...	... ...	... ...
5	**S**	Easter Day.	... ...	... ...
6	M	Bank Holiday.	... ...	... ...
7	T	... ...	... ...	... ...
8	W	... ...	... ...	... ...
9	Th	... ...	... ...	... ...
10	F	... ...	... ...	... ...
11	S	... ...	... ...	... ...
12	**S**	... ...	... ...	... ...
13	M	... ...	... ...	... ...
14	T	... ...	Newmarket Craven begins.	... ...
15	W	... ...	... ...	... ...

APRIL.—*Continued.*

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
16	Th	... ...	.. ...	'Ubique' Mark Lodge of Mark Master Masons meets at "Criterion."
17	F	R.A. Band Concert Queen's Hall at 3 p.m.	... ...	... ...
18	S	... ...	R.A. Steeplechases at Aldershot.	... ...
19	S	... ...	... ...	... ...
20	M	... ...	... ...	... ...
21	T	... ...	... ...	... ...
22	W	... ...	... ...	... ...
23	Th	... ...	... ...	... ...
24	F	... ...	... ...	... ...
25	S	... ...	... ...	... ...
26	S	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	Newmarket 1st Spring begins	... ...
29	W	... ...	... ...	... ...
30	Th	... ...	... ...	... ...

MAY.

1	F	... ...	... ...	... ...
2	S	1st Division joins at Golden Hill.	R.A. Woolwich *v.* Lessness Park at Abbey Wood.	... ...
3	S	... ...	... ...	... ...
4	M	... ...	... ...	... ...
5	T	... ...	... ...	... ...
6	W	... ...	R.A. Woolwich *v.* Lincoln Regt. at Woolwich.	... ...
7	Th	... ...	... ...	... ...
8	F	... ...	... ...	... ...
9	S	... ...	R.A. Woolwich *v.* Shoebury at Shoebury.	... ...
10	S	... ...	... ...	... ...
11	M	... ...	... ...	'Ubique' Lodge meets at "Criterion."
12	T	... ...	Newmarket 2nd Spring begins	... ...
13	W	... ...	R.A. Woolwich *v.* Granville at Woolwich.	... ...
14	Th	... ...	... ...	... ...
15	F	... ...	... ...	... ...
16	S	... ...	R.A. Woolwich *v.* N.-C.O's at Woolwich.	... ...
17	S	... ...	... ...	... ...
18	M	... ...	... ...	... ...
19	T	.. ...	R.A. Woolwich *v.* Blackheath at Blackheath.	... ...
20	W	... ...	... ...	... ...
21	Th	... ...	... ...	... ...
22	F	... ...	R.A. *v.* Aldershot Division at Aldershot.	... ...
23	S	2nd Division joins at Golden Hill.	R.A. *v.* Aldershot Division at Aldershot.	... ...
24	S	Whit Sunday.	... ...	... ...
25	M	Bank Holiday.	R.A. Woolwich *v.* R.M.A. at R.M.A.	... ...
26	T	... ...	... ...	... ...
27	W	... ...	R.A. Woolwich v. Charlton Park at Charlton.	... ...
28	Th	... ...	... ...	... ...
29	F	... ...	R.A. *v.* Eton Ramblers at Woolwich.	... ...
30	S	... ...	R.A. *v.* Eton Ramblers at Woolwich.	... ...
31	S	... ...	... ...	... ...

JUNE.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	M	... ...	R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
2	T	... ...	Epsom begins. R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
3	W	... ...	Derby. R.A. Woolwich *v.* R.N. College at Blackheath.	... ...
4	Th	... ...	... ...	... ...
5	F	... ...	Oaks.	... ...
6	S	... ...	R.A. Woolwich *v.* Shoebury at Woolwich.	... ...
7	S	... ...	... ...	... ...
8	M	... ...	... ...	'Ubique' Royal Arch Chapter meets at "Criterion." Installation of Principals.
9	T	... ...	... ...	... ...
10	W	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
11	Th	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
12	F	Annual General Meeting of R.A.I. at R.U.S.I. at 3 p.m	REGIMENTAL DINNER. R.A. *v.* B.B. at Woolwich.	
13	S	... ...	R.A. *v.* B.B. at Woolwich.	... ...
14	S	... ...	... ...	... ...
15	M	... ...	... ...	... ...
16	T	... ...	Ascot begins.	... ...
17	W	... ...	... ...	... ...
18	Th	... ...	... ...	... ...
19	F	... ...	R.A. *v.* R.E. at Chatham.	... ...
20	S	3rd Division joins at Golden Hill.	R.A. *v.* R.E. at Chatham.	... ...
21	S	... ...	... ...	... ...
22	M	... ...	R.A. Woolwich *v.* Granville at Lee.	... ...
23	T	... ...	... ...	... ...
24	W	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
25	Th	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
26	F	... ...	... ...	... ...
27	S	... ...	... ...	... ...
28	S	... ...	... ...	... ...
29	M	... ...	... ...	... ...
30	T	... ...	Newmarket 1st July begins.	... ...

JULY.

1	W	... ...	... ...	... ...
2	Th	... ...	Oxford *v.* Cambridge.	... ...
3	F	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
4	S	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
5	S	... ...	... ...	... ...
6	M	... ...	... ...	... ...
7	T	... ...	... ...	... ...
8	W	... ...	... ...	... ...
9	Th	... ...	... ...	... ...
10	F	... ...	Eton *v.* Harrow.	... ...
11	S	... ...	Eton *v.* Harrow.	... ...
12	S	... ...	... ...	... ...
13	M	... ...	R.A. *v.* Harlequins at Woolwich.	... ...
14	T	... ...	R.A. *v.* Harlequins at Woolwich.	... ...

JULY.—*Continued.*

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
15	W	... ...	R.A. *v.* Linton Park at Linton.	... ...
16	Th	... ...	R.A. *v.* Linton Park at Linton.	'Ubique' Mark Lodge of Mark Master Masons meets at "Criterion." Installation of W.M.
17	F	... ...	... ...	... ...
18	S	Long Course joins at Golden Hill.	R.A. Woolwich *v.* Blackheath at Woolwich.	... ...
19	S	... ...	... ...	... ...
20	M	... ...	... ...	... ...
21	T	... ...	... ...	... ...
22	W	... ...	R.A. *v.* Greenjackets at Winchester.	... ...
23	Th	... ...	R.A. *v.* Greenjackets at Winchester.	... ...
24	F	... ...	R.A. *v.* R.E. at Woolwich.	... ...
25	S	... ...	R.A. *v.* R.E. at Woolwich.	... ...
26	S	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	... ...	... ...
29	W	... ...	... ...	... ...
30	Th	... ...	... ...	... ...
31	F	... ...	R.A. *v.* Free Foresters at Woolwich,	... ...

NOTES
FROM
CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1896.

THE Committee will be glad to receive suggestions for Garrison Artillery subjects for the "Duncan" Gold Medal Prize Essay 1897; in accordance with the wish of the last Annual General Meeting a list of these subjects will be sent to all R.A. Messes at home and to such individual members as may ask for them, shortly before this year's Annual General Meeting, in order that members may come prepared to vote for the subject they prefer.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the five examinations ending November 1895:—

Captains (*c*) and (*d*) ... ... price 1s. 1d.
Lieutenants (*c*), (*d*) and (*e*) ... price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

R.A.I. "DUNCAN" PRIZE ESSAY, 1896.

THE Secretary has received Essays bearing the following mottoes:—

"They also serve who only stand and wait."

"Artillery without ammunition is a burden to its friends, preparatory to becoming a trophy for its enemies."

BOOKS RECOMMENDED FOR THE PROMOTION AND STAFF COLLEGE EXAMINATIONS.

BY

LIEUT.-COLONEL EDEN BAKER, R.A.

[*Always closely follow the Syllabus in the Queen's Regulations.*]

MILITARY LAW.

LIEUTENANTS.—Army Annual Act, 1895.
Manual of Military Law, 1894.—Army Act. Parts I., II., and V. (Sections 175 to 184 and 190). Rules of Procedure.
Queen's Regulations, 1895. Sections VI., XIX. and XXII.
Military Law, by Lieut.-Col. S. C. Pratt. 9th Edition, 1895.
Military Law Examiner by Lieut.-Col. S. C. Pratt, 1895.

CAPTAINS, IN ADDITION TO THE ABOVE:—
Manual of Military Law, 1894.—Army Act. Parts III., IV., and V. (Sections 185 to 189), and Schedules.

FIELD FORTIFICATION.

Instruction in Military Engineering. Part I., Field Defences 1892 (*omi* fougasses and large inundations.)
Manual of Military Engineering, 1893, (*omit* Sections 11 12, 17 and 20).
For Staff College.—Field Works by Col. C. B. Brackenbury, R.A.

MILITARY TOPOGRAPHY.

Text-book of Military Topography, 1888 (*omit* pages 110 to 158, and 181 to 227).

TACTICS.

Infantry Drill, 1893. *Read* the tactical part on pages xxiv, xxvi, 11, 50 51, 87, 90, 94 to 192, 244 to 249.
Précis of Modern Tactics by Home-Pratt.
Minor Tactics by Colonel Clery. 12th Edition. *Omit* examples except for the Staff College Examination.
Field Artillery, by Pratt-Baker, 1896. The tactical portion only.

ARTILLERY.—*Lieutenants R.A. only.*

Text-book of Gunnery, 1887. Chapters I., II., XII., XIV., and XVII. A new Edition is in the Press).
Treatise on Service Ordnance, 1893.
Treatise on Military Carriages, 1895.
Treatise on Ammunition, 1892. (A new Edition is in the Press).
Regulations for Magazines, &c., 1894. Also see Amendments published with Army Orders, 20th January, 1896.
Manual of Field Range-finding, 1890.
Hand-book for the Depression Range-finder, 1895.
Musketry Instruction, 1894. The Mekometer, p. 136.
} Alternative.
Field Artillery Drill, 1893. For Horse and Field Batteries only.
Garrison Artillery Drill, Vol. I., 1895; Vol. II., 1891.
Siege Artillery Drill, 1891.
} For Garrison Artillery only.
Field Artillery Service Handbook, 1896. (Now in the Press).
Handbook for Telescopic Sights, Land Service, 1894.

MILITARY ADMINISTRATION.—*Staff College and (g).*

The Army Book for the British Empire.

MILITARY HISTORY.—*Staff College only.*

Vide Army Order 72, May, 1894, and Army Order 185, November, 1895.
Précis of the Franco-German War by Pratt, published by the R.A. Institution.

ARTILLERY.—*Volunteer Officers (Captains and Lieutenants).*

Official Handbooks of Guns on which examined.
Field Artillery Drill, 1893.
Garrison Artillery Drill, Vol. I., 1895; Vol. II., 1891.
Handbook of Artillery *Matériel*, by Lieut.-Col. Morgan.

Officers going up for the Staff College Examination are recommended to read all Magazine Articles, Lectures, &c., that refer to Field Subjects.

ARTILLERY COLLEGE, WOOLWICH,
March, 1896.

ROYAL HORSE ARTILLERY.

THE following comparative states of the strength of Royal Artillery in 1865, when some of the Lieut.-Colonels, now serving, first joined the Regiment, and the present time are interesting on account of the recent *increase* of that arm.

1865.

BRITISH ESTABLISHMENT.

B Brigade A, B, C, D, E Batteries.	6 guns and about 104 horses each.
C „ A, B, C, D, E „	
Depôt ... ... 2 „	6 guns each (perhaps) 100 horses each.

INDIAN ESTABLISHMENT.

A Brigade A, B, C, D, E Batteries.	6 guns and 178 horses each.
C „ F ... ... „	
D „ A, B, C, D, F „	
E „ A, B, C, D, E „	
F „ A, B, C, D, E, F „	

TOTAL.

Batteries	33
Guns	198
Horses (about)	5000

1896.

BRITISH ESTABLISHMENT.

5 Six-gun Batteries	104 horses each.
5 Four-gun „	90 „ „
1 Two-gun Depôt	50 „ „

INDIAN ESTABLISHMENT.

11 Six-gun Batteries...	About 180 horses each.

TOTAL.

Batteries	22
Guns	118
Horses (about)	3000

R.A. REGIMENTAL POINT-TO-POINT RACES.

THESE races took place at Hillmorton near Rugby on Saturday, March 14th, over a course kindly arranged for us by Mr. John Darby, and were very successful. The course was a circular one about 4 miles over a fair hunting country.

FIRST RACE.

R.A. LIGHT WEIGHT POINT-TO-POINT RACE. Catch weights over 12 st. :—

Mr. J. C. Hankey's b. m. JINNY 1
Captain C. G. Mackenzie's ch. g. SHELL OUT 2
Mr. A. L. Birch's b. m. PENITENT 3

The following also started :—Captain Goulburn's "Sunshine," Captain Schofield's "Clonsilla," Mr. Davson's "Killun," Mr. Baillie's "Bess," Mr. Williams's "Blenkinsop," Mr. England's "Chopette," Mr. Aldridge's "Duchess," Mr. Stanley's "Rattle," Mr. Stanley's "Stilton," Mr. Head's "Game Cock," and Mr. Levita's "Dash."

This was a capital race all the way. Captain Goulburn cut out the work until he was unfortunately cannoned against and knocked over, when the running was taken up by Captain Schofield and Mr. Hankey in turn, closely pursued by Mr. Head and Captain Mackenzie. When about three miles had been covered Mr. Head went to the front and looked all over the winner, but at the last turn he ran out and Captain Schofield assumed the command and jumped first into the winning field but failed to stay home, and Mr. Hankey riding a nicely timed race beat "Shell Out" by half a length.

SECOND RACE.

R.A. HEAVY WEIGHT POINT-TO-POINT RACE. Catch weights over 13 st. 7 lbs. :—

Mr. Aldridge's ch. g. PETER 1
Captain Ferrar's gr. m. SPECULATION 2
Mr. Levitas' b. g. DOT-DASH 3

Also ran: Mr. Behren's "Destiny," Captain Powell's "The Priest," Captain Mackenzie's "Spider," Mr. Cooper Smith's "Sybil," Mr. Stanley's "The General," Mr. Stanley's "Struck Ile," Mr. Head's "Topthorn," Captain Schofield's "Paddy," Captain J. B. Askwith's "Cygnet."

This was a strongly run race, the pace being forced by Captain Powell, Cartain Ferrar, Mr. Head and Mr. Aldridge, the latter eventually winning somewhat easily by about twenty lengths.

THE FARMERS' RACE, for which there were 14 entries, was won by—
Mr. J. E. Marson's br. m. PORTIA 1
Mr. J. Drage's b. g. 2

A very popular win.

The lunch was well done by the R.A. Mess, Woolwich. Our warmest thanks are due to Mr. John Darby and the other land owners who so kindly allowed us to ride over their land; and it is hoped that this Meeting, which was started and has been carried out by the energy of Captain C. G. Mackenzie, R.A., will become one of our most popular Regimental gatherings.

SECUNDERABAD.

THE R.A. brought off a most successful little gymkhana on 22nd February. The fields were very good and the February Plate gave us one of the best races we have seen here. The 15 ponies got away to what looked, from the Stand, an excellent start and raced, all well closed up, to the distance, where the three placed horses came away and a really good race was won by "Simla," though had the distance been ten yards further "The Fool" would have won.

"Whisky," with his sporting owner up, had a benefit in the Beginners' Stakes, for the verdict might have been twenty lengths had he been ridden out.

In the Spring Purse, "Early Dawn," on the way to the starting post, took charge of his rider and gave him a nice little exercising gallop, *viâ* the Club, Begumpett, Bowenpilly and a few other outlying cantonments, coming in at last with the tail of the Postillion Race. "Inshallah" and "Sunbeam" led throughout, "Sunbeam" winning a good race by a neck.

The fifth event, Postillion Race, was won easily by Mr. Boggs, whose pair fenced beautifully.

Tilting at the Ring finished the programme, won by Mrs. Thackeray with three rings, against two to Mrs. Stokes, Mrs. Fischer, Mrs. Penno and Mrs. Lawrie.

The band of the Northampton Regiment, by the kind permission of Colonel Chayter and officers, played during the afternoon.

The Ubique Stakes.—Rs. 50. For all horses, the property of R.A. Officers, Trimulgherry, that have never won Rs. 50. Catch weights 11 st. 7 lbs. Distance—½ mile :—

Mr. Hope's b aus g CAMEL, 11 st. 7 lbs. ..... OWNER 1
Mr. Cubitt's ch aus g ASTLEY, 11 st. 7 lbs..... OWNER 2
Major Dewar's b aus TIPPOO, 11 st. 7 lbs..... OWNER 3

Also ran : Four others.

Won by a length and a half ; half a length between second and third.

The February Plate.—Rs. 50. For all Maiden Arabs and C. B. Galloways, 13-3 and under, 13-3 to carry 11 st. 7 lbs., C. Bs. allowed 7 lbs. W. I. Penalties—Winners of Rs. 50, once 4 lbs.; twice 7 lbs.; oftener 10 lbs. Distance —3½ furlongs :—

Mr. Jardine's b a p SIMLA, 10 st. 4 lbs..... OWNER 1
Mr. Saunder's g a p THE FOOL, 10 st. 13 lbs..... OWNER 2
Captain Logan-Home's b a gall. B., 11 st. 8 lbs.....Mr. CLARIDGE 3

Also ran : Twelve others.

Won by a short head ; half a length between second and third.

The Beginner Stakes.—Rs. 50. For all ponies 13-3 and under, the property of R.A Officers, Trimulgherry, that have never won Rs. 50 ; catch weights 11st. 7lbs. Distance—3½ furlongs.

Mr. Cubitt's b a p WHISKY, 11 st. 7 lbs..... OWNER 1
Mr. Douglas' b a gall JOBY, 11 st. 7 lbs.....MAJOR DEWAR 2
Mr. Hope's b a gall TORBAY, 11 st. 7 lbs..... OWNER 3

Also ran : Six others.

Won with ease by two lengths ; same distance between second and third.

The Spring Purse.—For horses that have never won Rs. 50. W. A. C. raised 21 lbs. Owners allowed 5 lbs. Distance—5 furlongs.

Mr. Stapylton's b aus m SUNBEAM, 10 st. 11 lbs.....Mr. PAULET 1
Mr. Taylor's br aus g INSHALLAH, 10 st. 11 lbs .....Mr. SMYTH 2
Capt. Doyne's bk aus g RICHMOND, 10 st. 11 lbs.....OWNER 3

Also ran : Three others.

Won by a neck ; two lengths between second and third.

Tilting at the Ring out of dog-carts. Gentlemen to drive, ladies to tilt. 1st prize an *objet d'art*, 2nd Prize (to go to the gentleman) a box "worth a guinea." Fourteen Competitors.

Won by Mrs. Thackeray.

Postillion Race.—Ride one pony and lead another about ½ mile over low hurdles. 1st Prize a whip, 2nd Prize ditto.

Mr. Boggs	1	Mr. Giffard	4
Mr. Hope	2	Mr. Claridge	0
Mr. Ready	3	Captain Doyne	0

OBITUARY.

Major P. F. P. Hamilton, who died at Leamington on 4th March, 1896, joined the Regiment as Lieutenant, 15th December, 1871; became Captain, 25th July, 1881; and Major, 15th August, 1888. He served in the Afghan War, 1878–80, and was present at the battle of Ahmed Khel, and action of Urzoo. (Mentioned in Despatches; medal with clasp). The last honours were paid to his remains by the 37th Field Battery, in command of which he died, and other troops and officers of the Portsmouth Garrison. By his death the Regiment loses comparatively early in life a good soldier and excellent comrade.

Major C. Jones (retired), whose death occurred at Constantine, Algeria, on 6th March, 1896, was first commissioned as Lieutenant, 19th June, 1860; became Captain, 2nd November, 1872; and retired on a pension, 27th November, 1880 with the rank of Major.

Captain J. R. J. Robertson (retired) died at South Hampstead on 14th March, 1896. Captain Robertson joined the Madras Artillery as 2nd Lieutenant, 13th June, 1845; became Lieutenant, 22nd August, 1848; Captain, 27th August, 1858; and retired on half-pay, 10th June, 1864.

General H. P. Yates, C.B., Col.-Commandant, died at Penzance on 14th March, 1896. He was first commissioned as 2nd Lieutenant, 2nd May, 1847; became Lieutenant, 30th June, 1848; 2nd Captain, 6th July, 1854; Captain, 15th February, 1859; Brevet-Major, 12th December, 1854; Lieut.-Colonel, 26th April, 1859; Colonel, 26th April, 1867; Major-General, 1st May, 1880; Lieut.-General, 20th November, 1884; General, 1st May, 1885; and Col.-Commandant, 12th April, 1890. General Yates served during the Crimean Campaign, 1854, was present at the affair of McKenzie's farm, the battles of Alma and Inkerman, the siege of Sebastopol and repulse of the sortie of 26th October, 1854. (Despatches, *London Gazette*, 12th November, 1854. Medal with 3 clasps; Brevet of Major; Sardinian and Turkish medals; 5th class of the Mejidie). He served in the Indian Mutiny, 1857–8, and was present at the action of Secundra, siege and capture of Lucknow, commanded the R.H.A. at the affairs of Saragunge on the 23rd and 29th July, and in the actions at Sultanpore, 13th and 28th August, 1858, served also in the campaign in Oude. (Despatches, *London Gazette*, 31st March and 25th May, 1858; and 31st January, 1859. Medal with clasp, C.B., Brevet of Lieut.-Colonel).

DIARY OF FIXTURES.

APRIL.

Day of the Mth	Wk	Regimental.	Cricket, &c.	Private.
1	W	... ...	... ...	... ...
2	Th	... ...	... ...	... ...
3	F	Good Friday.	... ...	... ...
4	S	... ...	... ...	... ...
5	S	Easter Day.	... ...	... ...
6	M	Bank Holiday.	... ...	... ...
7	T	... ...	... ...	... ...
8	W	... ...	... ...	... ...
9	Th	... ...	... ...	... ...
10	F	... ...	... ...	... ...
11	S	... ...	... ...	... ...
12	S	... ...	... ...	... ...
13	M	... ...	... ...	... ...
14	T	... ...	Newmarket Craven begins.	... ...
15	W	... ...	... ...	... ...
16	Th	... ...	.. ...	'Ubique' Mark Lodge of Mark Master Masons meets at "Criterion."
17	F	R.A. Band Concert Queen's Hall at 3 p.m.	....	... ...
18	S	... ...	R.A. Steeplechases at Aldershot.	... ...
1	S	... ...	... ...	... ...
20	M	... ...	... ...	... ...
21	T	... ...	... ...	... ...
22	W	... ...	... ...	... ...
23	Th	... ...	... ...	... ...
24	F	... ...	... ...	... ...
25	S	... ...	... ...	... ...
26	S	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	Newmarket 1st Spring begins	... ...
29	W	... ...	... ...	... ...
30	Th	... ...	... ...	... ...

MAY.

1	F	... ...	... ...	... ...
2	S	1st Division joins at Golden Hill. 1st Division (R.H.A. mixed) reaches Shoeburyness.	R.A. Woolwich *v.* Lessness Park at Abbey Wood.	... ...
3	S	... ...	... ...	... ...
4	M	... ...	... ...	... ...
5	T	... ...	... ...	... ...
6	W	... ...	R.A. Woolwich *v.* Lincoln Regt. at Woolwich.	... ...
7	Th	... ...	... ...	... ...
8	F	... ...	... ...	... ...
9	S	1st Division (F.A. Aldershot) reaches Okehampton. 2nd Division (F.A. Weedon) reaches Shoeburyness.	R.A. Woolwich *v.* Shoebury at Shoebury.	... ...
10	S	... ...	... ...	... ...
11	M	... ...	... ...	'Ubique' Lodge meets at "Criterion." Installation of W.M. and Banquet.

MAY.—*Continued.*

Day of the Mth	Wk	Regimental.	Cricket, &c.	Private.
12	T	... ...	Newmarket 2nd Spring begins	... ...
13	W	... ...	R.A. Woolwich *v.* Granville at Woolwich.	... ...
14	Th	... ...	... ...	... ...
15	F	... ...	... ...	... ...
16	S	3rd Division (F.A. mixed) reaches Shoeburyness.	R.A. Woolwich *v.* N.-C.O's at Woolwich.	... ...
17	S	... ...	... ...	... ...
18	M	... ...	... ...	... ...
19	T	.. ...	R A. Woolwich *v.* Blackheath at Blackheath.	... ...
20	W	... ...	... ...	... ...
21	Th	... ...	... ...	... ...
22	F	... ...	R.A. *v.* Aldershot Division at Aldershot.	... ...
23	S	2nd Division joins at Golden Hill. 4th Division (F.A. Woolwich) reaches Shoeburyness.	R.A. *v.* Aldershot Division at Aldershot.	... ...
24	S	Whit Sunday.	... ...	... ...
25	M	Bank Holiday.	R.A. Woolwich *v.* R.M.A. at R.M.A.	... ...
26	T	... ...	... ...	... ...
27	W	... ...	R.A. Woolwich v. Charlton Park at Charlton.	... ...
28	Th	... ...	... ...	... ...
29	F	... ...	R A. *v.* Eton Ramblers at Woolwich.	... ...
30	S	5th Division (R.H.A. Woolwich) reaches Shoeburyness.	R.A. *v.* Eton Ramblers at Woolwich.	... ...
31	S	... ...	... ...	... ...

JUNE.

1	M	... ...	R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
2	T	... ...	Epsom begins. R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
3	W	... ...	Derby. R.A. Woolwich *v.* R.N. College at Blackheath.	... ...
4	Th	2nd Division (R.H.A. Aldershot) reaches Okehampton.	... ...	... ...
5	F	... ...	Oaks.	... ...
6	S	6th Division (F.A. Aldershot) reaches Shoeburyness.	R.A. Woolwich *v.* Shoebury at Woolwich.	... ...
7	S	... ...	... ...	... ...
8	M	... ...	... ...	'Ubique' Royal Arch Chapter meets at "Criterion." Installation of Principals.
9	T	... ...	... ...	... ...
10	W	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
11	Th	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
12	F	Annual General Meeting of R.A.I. at R.U.S.I. at 3 p.m	R.A. *v.* B.B. at Woolwich.	REGIMENTAL DINNER. ...
13	S	7th Division (F.A. Woolwich) reaches Shoeburyness.	R.A. *v.* B.B. at Woolwich.	... ...
14	S	... ...	... ...	.. ...
15	M	... ...	... ...	... ...
16	T	... ...	Ascot begins.	... ...
17	W	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	F	... ...	R.A. *v.* R.E. at Chatham.	...

JUNE.—*Continued.*

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
20	S	3rd Division joins at Golden Hill.	R.A. *v.* R.E. at Chatham.	... ...
21	**S**	... ...	... ...	... ...
22	M	... ...	R.A. Woolwich *v.* Granville at Lee.	... ...
23	T	... ...	... ...	... ...
24	W	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
25	Th	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
26	F	... ...	... ...	... ...
27	S	1st Division (F.A. Newcastle) reaches Church Stretton.	... ...	... ...
28	**S**	... ...	... ...	... ...
29	M	... ...	... ...	... ...
30	T	... ...	Newmarket 1st July begins.	... ...

JULY.

1	W	3rd Division (F.A. Exeter) reaches Okehampton.	... ...	... ...
2	Th	... ...	Oxford *v.* Cambridge.	... ...
3	F	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
4	S	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
5	**S**	... ...	... ...	... ...
6	M	... ...	... ...	... ...
7	T	... ...	... ...	... ...
8	W	... ...	... ...	... ...
9	Th	... ...	... ...	... ...
10	F	... ...	Eton *v.* Harrow.	... ...
11	S	2nd Division (F.A. Sheffield) reaches Church Stretton.	Eton *v.* Harrow.	... ...
12	**S**	... ...	... ...	... ...
13	M	... ...	R.A. *v.* Harlequins at Woolwich.	... ...
14	T	... ...	R.A. *v.* Harlequins at Woolwich.	... ...
15	W	... ...	R.A. *v.* Linton Park at Linton.	... ...
16	Th	4th Division (F.A. Woolwich) reaches Okehampton.	R.A. *v.* Linton Park at Linton.	'Ubique' Mark Lodge of Mark Master Masons meets at "Criterion." Installation of W.M.
17	F	... ...	... ...	... ...
18	S	Long Course joins at Golden Hill.	R.A. Woolwich *v.* Blackheath at Woolwich.	... ...
19	**S**	... ...	... ...	... ...
20	M	... ...	... ...	... ...
21	T	... ...	... ...	... ...
22	W	... ...	R.A. *v.* Greenjackets at Winchester.	... ...
23	Th	... ...	R.A. *v.* Greenjackets at Winchester.	... ...
24	F	... ...	R.A. *v.* R.E. at Woolwich.	... ...
25	S	... ...	R.A. *v.* R.E. at Woolwich.	... ...
26	**S**	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	... ...	... ...
29	W	... ...	... ...	... ...
30	Th	... ...	... ...	... ...
31	F	... ...	R.A. *v.* Free Foresters at Woolwich.	... ...

AUGUST.

Day of the Wk	Mth	Regimental.	Cricket, &c.	Private.
1	S	... ...	R.A. *v.* Free Foresters at Woolwich.	... ...
2	S	... ...	... ...	... ...
3	M	... ...	R.A. *v.* Authentics at Woolwich.	... ...
4	T	... ...	R.A. *v.* Authentics at Woolwich.	... ...
5	W	... ...	R.A. *v.* I. Zingari at Woolwich.	... ...
6	Th	... ...	R.A. *v.* I. Zingari at Woolwich.	... ...
7	F	... ...	... ...	... ...
8	S	... ...	... ...	... ...
9	S	... ...	... ...	... ...
10	M	... ...	... ...	... ...
11	T	5th Division (F.A. Ipswich) reaches Okehampton.	... ...	... ...
12	W	... ...	R.A. Woolwich *v.* Lincoln Regt. at Woolwich.	... ...
13	Th	... ...	... ...	... ...
14	F	... ...	R.A. Woolwich *v.* West Kent at Woolwich.	... ...
15	S	4th Division joins at Golden Hill.	R.A. Woolwich *v.* Fernwood at Woolwich.	... ...
16	S	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	W	... ...	R.A. Woolwich *v.* Charlton Park at Woolwich.	... ...
20	Th	... ...	... ...	... ...
21	F	... ...	... ...	... ...
22	S	... ...	R.A. Woolwich *v.* Lessness Park at Woolwich.	... ...
23	S	... ...	... ...	... ...
24	M	... ...	R.A. Woolwich *v.* West Kent at Woolwich.	... ...
25	T	... ...	... ...	... ...
26	W	... ...	... ...	... ...
27	Th	... ...	... ...	... ...
28	F	... ...	... ...	... ...
29	S	... ...	R.A. Woolwich *v.* N.-C.O's. at Woolwich.	... ...
30	S	... ...	... ...	... ...
31	M	... ...	... ...	... ...

NOTES

FROM

CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1896.

THE Committee will be glad to receive suggestions for Garrison Artillery subjects for the "Duncan" Gold Medal Prize Essay 1897; in accordance with the wish of the last Annual General Meeting a list of these subjects will be sent to all R.A. Messes at home and to such individual members as may ask for them, shortly before this year's Annual General Meeting, in order that members may come prepared to vote for the subject they prefer.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

"The Shrapnel Fire of the Field Artillery" by Major-General Rohne. Translated by Colonel N. L. Walford, price 2s. 6d.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the five examinations ending November 1895:—

Captains (*c*) and (*d*) ... ... price 1s. 1d.
Lieutenants (*c*), (*d*) and (*e*) ... price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

The R.A. Institution have copies of the undermentioned works bound in cloth, which can be bought by members at the price of 1s. each:—

Colonel Walford's Translation of Prince Kraft's Letters on Infantry. 35 copies.

Colonel Walford's Translation of Prince Kraft's Letters on Cavalry. 18 copies.

They are the copies as published in Translations with the "Proceedings" and should be useful to members who have joined since the date of their publication.

As a great many applications have been received for supply of copies of "Field Artillery Drill, 1896," the following remark of the Controller, H.M. Stationery Office, is published for the information of those who have applied: "The 1896 edition is only in the *proof* stage—and is not likely to be ready for some time."

R.A.I. "DUNCAN" PRIZE ESSAY, 1896.

The Secretary has received Essays bearing the following mottoes in addition to those previously notified:—

"Vigilentia non cadet."
"Hold sure."
"At rest but ready."
"No loss no victory."
"Cavendo tutus."
"Quis separabit."
"Semper vigilans."

R.A. INSTITUTION.

The Annual General Meeting, R.A. Institution, will be held at the R.U.S.I., Whitehall, at 3 p.m. on Friday, 12th June, 1896.

REGIMENTAL DINNER.

His Royal Highness, the Colonel of the Regiment, has repeatedly expressed his disappointment at the numbers who attend the Regimental Dinner, especially in the junior ranks; in addition to this, many officers of the Regiment have expressed an opinion that the dinner is too expensive. An effort is being made this year to bring about an improvement in both respects without lowering the high standard of excellence of the dinner and the wines. One item, viz. turtle soup, is withdrawn from the menu, and the cost of the dinner reduced by 3s.

The question of the reduction in price has been gone into with great care, and it was found that the only way in which a reduction could be effected was either by adopting lower priced wines, or by striking out the most costly item in the menu, turtle soup; by no other rearrangement of the menu could anything like the same result be arrived at. Accordingly the question of "No turtle soup and a reduction in the price of the dinner by 3s.," was put to the vote; in the first instance the question was submitted to the members of the Dinner Club, with the result that there was a majority of nine to one in favour of the proposal; the same question was then put to all the Artillery Messes in the United Kingdom, with the result that the general opinion was found to be decisively in favour of the proposition. With this single exception then, the dinner

of 1896 will in every respect be equal to its predecessors, and it is hoped that, in certain matters of detail, arrangements may be made to carry into effect some of the valuable suggestions which have been received.

Another point has been raised, which is the desirability of largely increasing the number of members of the Dinner Club; the annual subscription is only 5s., but the entrance fees have hitherto been :—

(*a*).	On first commission	Free.
(*b*).	Lieutenants or Second Lieutenants—by payment of 5s. for every year of service up to a maximum of five years, *i.e.*	£1 5 0
(*c*).	Captains	1 10 0
(*d*).	Majors	1 15 0
(*e*).	Lieutenant-Colonels	2 0 0

These entrance fees have now been reduced by the unanimous (one dissentient) vote of the members of the Dinner Club and are now as follows :—

(*a*).	Second Lieutenants	Free.
(*b*).	Lieutenants—by payment of 5s. for every year of service in that rank up to a maximum of three years, *i.e.*	£0 15 0
(*c*).	Captains	1 0 0
(*d*).	Majors	1 5 0
(*e*).	Lieutenants-Colonels	1 10 0

It is hoped that these reductions will bring about a sensible increase in the number of members.

The price of the dinner to members of the club will be only 13s., plus the annual subscription of 5s. For non-members the price be £1 12s.

The management of the funds now requires some explanation. The charges which have to be met are :—

1. Dinner and wines, &c., payable to the manager of the Whitehall rooms at so much per head.
2. Cigars—according to consumption.
3. Fixed charges, such as rail expenses, &c. of band, supper for band and attendants, postage, stationery, printing and advertising. Clerk and accountant's fee, commission on banking account.

The accounts can be inspected by any member of the club or any officer of the Regiment interested in the dinner, at the office of the D.-A.-A.-G., R.A., in the War Office. Any suggestions or proposals can be made in writing, or brought forward at the Annual General Meeting at the Royal United Service Institution, on the day of the dinner.

As regards 1 and 2, the total cost practically varies directly as the number present at dinner; but 3 is on a different footing—the sums to be paid are practically the same whether there are 100 or 300 at dinner, it will therefore be obvious that if the price for the dinner and incidentals is fixed at so much a head on an average attendance, there will be a surplus or a deficit according as the attendance is above or below the average; consequently, if there were no fund to fall back upon, it would be necessary to fix the price at such a figure as to allow a fair margin of safety to provide for fluctuations in numbers. This course is, however, fortunately unnecessary, as the entrance fees of members of the club form a reserve fund upon which to draw, in case of a deficit; thus allowing the price for the dinner to be fixed at such a figure, that when there is an exceptionally good attendance, there is only an infinitesimal margin of profit to carry forward, while in the case of a poor attendance there is no necessity to incur additional expense and cause

annoyance to officers who have been present by sending round a whip for a 1s. a head to make up the deficit. The entrance fees in fact form the working capital.

Now as regards the difference in the charges made to members and non-members:—The total cost of the dinner and contingent expenses having been divided equally between the average numbers dining, gives the average price to be paid per head; this price is charged to non-members; the members of the club, however, get the advantage of the annual subscriptions, and the price they have to pay depends immediately and solely on the proportion of subscribers who do not dine, on each occasion, to those who do dine. A ratio of 2·8 : 1 enables the price for members to be fixed as at present; if that ratio can be increased, the price to members can be proportionably reduced. There is no doubt that if we could get anything like a really good proportion of officers of the Regiment to join the club, the above ratio would be perceptibly increased and the price to a member, when he dined, would be little more than nominal.

RULES, 1896.

(1). Entrance fees and *first* annual subscription (5s.) are payable at any time up to the 9th June; the dinner will take place on the 12th June.

(2). Subsequent annual subscriptions are payable on 1st January.

(3). Officers wishing to become members of the club, are requested to notify the

Hon. Secretary,
R.A. Dinner Club,
War Office, Pall Mall,

informing him at the same time that the amount of their entrance fee together with the annual subscriptions has been credited by Messrs. Cox & Co. to the Dinner Fund.

(4). Officers intending to dine, whether they are members or not, are requested to notify their intention to the Hon. Secretary, not later than the 9th June; notifications *received* subsequent to the 10th June will incur a fine of 5s. Similarly any notifications of withdrawal must not be *received* later than the 10th June, as no money can be refunded after that date.

(5). Officers who bank with Cox & Co. will have the dinner charged against their accounts (13s. for members, £1 12s. for non-members). Officers who do no bank with Cox & Co. are requested to remit the amount payable for the dinner to the Hon. Secretary.

(6). Officers wishing to make up a party to sit together, can secure seats by applying as early as possible to the Hon. Secretary.

(7). Officers who have not made arrangements as in (6) are recommended to place their cards in any seats which they may wish to select before dinner is served.

F. G. Stone, Major R.A.,
Hon. Sec., R.A. Dinner Club.

WOOLWICH.

Lieut.-Colonel F. A. Yorke, R.A. wishes to thank most heartily all those officers who so kindly gave him the present of a handsome clock. The clock bears an inscription: "Presented to Lieut.-Colonel F. A. Yorke, R.A., by members of the Royal Artillery Woolwich Drag Hunt, in recognition of his long and successful mastership from 1889 to 1895."

THE ROYAL ARTILLERY DRAG HUNT POINT-TO-POINT RACES.

THE above races were held at Dunton Green, Sevenoaks, on Monday, March 23rd, over a four mile course which had been selected by Colonel R. D. Eliott Lockhart and the members of the committee.

GARRISON CHALLENGE CUP. Presented by Major-General A. H. Williams, R.A., for *bonâ-fide* Maiden Hunters, the property of Officers of the Woolwich Garrison, that have been regularly hunted with the R.A. Drag Hunt during the past season, to be ridden by their owners. Catch-weights over 12 st. 7 lbs.

Captain Heygate's SHAMROCK	OWNER	1
Mr. J. B. Aldridge's DUCHESS	OWNER	2
Captain Ferrar's SPECULATION	OWNER	3
Mr. J. C. A. Hankey's THE SLUMP	OWNER	4
Mr. J. A. Tyler's VIOLET	OWNER	0
Captain F. E. Cooper's KATIE	OWNER	0
Mr. E. P. England's CHOPETTE	OWNER	0
Mr. Head's GAMECOCK	OWNER	0
Mr. Gibbes' BIDDY	OWNER	0
Mr. C. H. Wilson's VICTOR	OWNER	0

"Duchess" made the running up to the turning point, closely followed by "Shamrock" and "Speculation." Here "Shamrock" took the lead with "Speculation" second. This order was maintained to the last fence, when "Duchess" passed "Speculation," but failed to catch "Shamrock," who won after a very close finish. "Speculation" third, five lengths behind. All the field well up, a very fast and keenly contested race. Captain Heygate having won this race three years, becomes the owner of the cup.

HEAVY-WEIGHT RACE. For horses the property of members and regularly hunted with the R.A. Drag Hunt. Catch-weights over 14 st.

Mr. J. B. Aldridge's PETER	OWNER	1
Captain H. L. Powell's THE PRIEST	OWNER	2
Captain C. D. King's QUICKSTEP	OWNER	3

FARMERS' CATCH-WEIGHTS over 12 st. 7 lbs.

Mr. J. White's THE PRIEST	MR. BRYDONE	1
Mr. Wilmot's PITCH AND TOSS	OWNER	2
Mr. R. Dark's NO NAME	OWNER	3

The above two classes started together. Captain Powell's "The Priest" lead for the first two miles, followed by "Peter," when the former fell and "Peter" won easily. Mr. White headed the field for the farmers'.

LIGHT-WEIGHT RACE. For horses the property of members and regularly hunted with the R.A. Drag Hunt. Catch-weights over 12 st.

Captain Ferrar's SURPRISE	OWNER	1
Mr. Aldridge's CANDY	OWNER	2
Mr. Head's LUCIFER	MR. HANKEY	3
Mr. Head's TOPTHORNE	OWNER	4
Mr. A. B. Clarke's SHEILA	OWNER	0
Major Baldock's B. G. BY ASCETIC	OWNER	0
Mr. Parsons' MIRROR	MR. TYLER	0

"Mirror" went away with a long lead, followed by "Candy" and "Surprise." At the turning point "Mirror" and "Candy" refused and "Surprise" went to the front and, keeping the lead, won as he liked. Captain Ferrar has now won this race three years in succession with the same horse.

ALDERSHOT.

ROYAL ARTILLERY STEEPLE-CHASES.

SATURDAY, APRIL 18TH.

THE Royal Artillery Meeting held at Aldershot proved a success in every way. The weather was brilliantly fine, the attendance large, and the fields good, as many as 42 horses taking part in the six events that made up the programme.

THE ROYAL ARTILLERY LIGHT-WEIGHT STEEPLE-CHASE of 50 sovs., with 10 sovs. to the second, and 5 sovs. to the third. Two miles and five furlongs.

Captain Ferrar's PRINCESS CLARE, 5 yrs., 11 st. 7 lb.....OWNER 1
Mr. C. B. Levita's CONQUERER, 5 yrs,, 11 st. 7 lb. (car. 11 st. 9 lbs.).....OWNER 2
Mr. C. O. Head's LUCIFER, 5 yrs., 11 st. 7 lbs. (car. 11 st. 8 lbs.).....OWNER 3
Mr. A. F. Becke's THE LODGER, 6 yrs., 11 st. 7 lbs.....OWNER 0
Captain Breeks's GAZELLE, 5 yrs., 12 st. .....MR. S. CROCKETT 0
Mr. J. B. Aldridge's CANDY, aged, 11 st. 7 lbs.....OWNER 0
Captain Goulburn's SUNSHINE, aged, 11 st. 7 lbs.....OWNER 0
Mr. A. G. Arbuthnot's LEILA, aged, 11 st. 7 lbs. (car. 11 st. 8 lbs.).....OWNER 0
Mr. E. H. T. Parsons's THE MIRROR, aged, 12 st....MR. J. A. TYLER 0
Mr. G. Baillie's BESS, aged, 11 st. 7 lbs. (car. 11 st. 8 lbs.)...OWNER 0
Mr. A. C. Birch's PENITANT, aged, 11 st. 7 lbs. (car. 11 st. 8 lbs.).....OWNER 0

Betting: 4 to 1 agst. "Princess Clare," 5 to 1 agst. "The Lodger," 6 to 1 agst. "Gazelle," 8 to 1 agst. "Leila," and 10 to 1 agst. any other.

"Conqueror" made the running from "The Lodger" and "Candy," with "Leila" last. After going a little over a mile "The Lodger" took command, but he fell almost immediately, and "Conqneror" again held command. Half a mile from home "Leila" ran out, and the favourite drawing up took the lead turning into the straight and won cleverly by three lengths: six divided second and third. "Penitant" was fourth.

AN OPEN MILITARY MAIDEN STEEPLE-CHASE of 40 sovs. Two miles. Four starters.

THE ROYAL ARTILLERY WELTER STEEPLE-CHASE of 50 sovs., with 10 sovs. to the second, and 5 sovs. to the third. Two miles and five furlongs.

Captain J. Hanwell's PUFF, aged, 13 st. 7 lbs.....OWNER 1
Captain Breeks's STAR ONE, 6 yrs.. 14 st. .....MR. S. CROCKETT 2
Mr. J. B. Aldridge's PETER, aged, 13 st. 7 lbs.....OWNER 3
Mr. G. Stanley's THE GENERAL, aged, 13 st. 7 lbs.....OWNER 0
Mr. C. B. Levita's SPIDER, aged, 13 st. 7 lbs.....OWNER 0
Mr. J. A. Hobson's BOBBY, aged, 13 st. 7 lbs.....OWNER 0
Mr. W. Elwes's CHANG, aged, 13 st. 7 lbs.....OWNER 0

Betting: 6 to 4 agst. "Puff," 2 to 1 agst. "Star One," 5 to 1 agst. "Spider," 6 to 1 agst. "The General" and "Peter," and 10 to 1 agst. any other.

"Spider" cut out the work, closely attended by "Puff," and in this way they went for half a mile, when "Star One" took up the running. Rounding the bend for the straight, "Star One" and "Puff" were well ahead of the others, and a good race home between the two ended in favour of "Puff" by a length; a bad third.

THE ROYAL ARTILLERY GOLD CUP value 100 sovs., with 50 sovs. to the winner, 20 to the second, and 10 to the third. Three miles.

Mr. J. F. Lamont's HONOR OAK, 5 yrs., 12 st. 7 lbs	OWNER	1
Mr. H. D. O. Ward's STOCKERSTON, aged, 12 st	MR. PEEL	2
Captain J. Hanwell's PUFF, aged, 12 st. (car. 12 st. 7 lbs.)	OWNER	3
Captain H. L. Powell's THE PRIEST, aged, 12 st	MR. HEAD	4
Captain Ferrar's SURPRISE, aged, 13 st	OWNER	0
Mr. G. Stanley's RATTLE, aged, 12 st	OWNER	0
Captain W. Paget's SOLITUDE, aged, 12 st	MR. ALDRIDGE	0
Captain Breeks's WANDERER, aged, 12 st	MR. S. CROCKETT	0
Mr. A. F. Becke's BALLARAT, 6 yrs., 12 st	OWNER	0
Mr. A. Cowper-Smith's SIBYL, aged, 12 st. (car. 12 st. 5 lbs.)	OWNER	0

Betting: 7 to 2 agst. "Stockerston," 4 to 1 agst. "The Priest," 9 to 2 agst. "Honor Oak," 6 to 1 each agst. "Surprise" and "Puff," and 10 to 1 agst. any other.

"The Priest" was first to show in front just clear of "Honor Oak" and "Sibyl," with "Surprise" last, and so they ran to the hill where "Honor Oak" took up the running. A mile from home the favourite joined the leader, but "Honor Oak" quickly drew away again and won comfortably by eight lengths; "Puff" was a bad third. "The Priest" fourth, "Sibyl" fifth, and "Solitude" last.

THE UNITED SERVICE HANDICAP STEEPLE-CHASE of 50 sovs. Two miles and five furlongs. Four starters.

ROYAL ARTILLERY CONSOLATION STEEPLE-CHASE of 25 sovs., for beaten horses in the regimental races; 12 st. each. Two miles.

Mr. ARBUTHNOT'S LEILA, aged	OWNER	1
Captain Breeks's STAR ONE, 6 yrs	MR. S. CROCKETT	2
Mr. Parson's THE MIRROR, aged	MR. TYLER	3
Mr. C. B. Levita's CONQUEROR, 5 yrs	MR. PEEL	0
M. A. F. Becke's THE LODGER, 6 yrs	OWNER	0
Mr. Aldridge's CANDY, aged	OWNER	0

Betting: 2 to 1 each agst. "Star One" and "Conqueror," and 5 to 1 agst. any other.

After going half a mile "Leila" took up the running, closely attended by "Star One," and the two drawing away from the field, finished a length apart. "Conqueror" came in third, but failed to draw the weight, and the place was awarded to "The Mirror," who came in fourth.

GIBRALTAR.

So many gunners, past and present, have seen sport with the Calpe Hunt that a brief account of the annual Point-to-Point Race of the followers of these hounds —in which the R.A. took a prominent part—may not be without interest to the readers of the "Proceedings."

The Point-to-Point Race has now become an annual institution at the Rock, and besides giving a prize to the actual first, it resolves itself into an inter-regimental contest among the officers of the various corps and departments in garrison.

The first soldier past the post scores 20 points, the next 19, and so on, down to the 20th, who scores 1, and the regiment or department with the largest score wins the cup. The contest generally lies between the R.A. and the R.E., probably on account of their large numbers, and this year a rule was introduced that not more than the first six of any one regiment or corps should score marks, which had the effect of cutting out three gunners, nine of whom were in the first twenty.

Last year the R.A. won the prize, and the year before the R.E. secured it, both victories being obtained by narrow margins, but this year the Staff, with several strong representatives, were thought to have a good chance.

The course was chosen by the Master, Mr. Pablo Larios, who acted as starter, and who—meeting the field, which reached the large number of 69, at the first Venta—led them across the first river through Dyer's Covert up the stony ravines beyond it and out to the N.W. of what is known as Holdsworth's Gorze after a late popular M.F.H. and C.R.A. at Gibraltar. Here the competitors were informed that the finish was on the open ground east of the river, between the second Venta and the Duke of Kent's Farm, close to the edge of the Cork Woods, and it was at once apparent that the Agua Corta Brook, the high Pino Ridge, the first river itself, and the railway must be crossed before the goal, distant about four miles, was reached.

The main obstacle was, of course, the river, and opinions were divided as to whether it should be crossed at the Venta Ford or at that opposite the Duke of Kent's Farm. The field were soon despatched and before very long Mr. Charlie Larios, who rides a nice light-weight and was mounted on a very well bred English mare, showed the way, his knowledge of the country serving him in good stead. He was followed by a large contingent of R.E., but the gunners were not very fortunate at the outset, encountering some bad ground.

On crossing the Agua Corta stream, however, they made a sharp turn to the left, led by Colonel Adye, which placed them in a forward position on gaining the crest of the Pino ridge. From here the winning post, some mile and a half distant, could be seen in the valley below and the field divided down the two main spurs that lead to the river. A considerable portion made for the second Venta Ford, but another and more fortunate division followed Mr. C. Larios's pink coat straight at the river, of which he knew a crossing not known to any one else. When the level valley was reached Mr. Larios led by about a hundred yards and was followed by Lieut.-Colonel Adye and Captain Phillips, R.A., Captain Bigge, R.E., and Colonel Gordon and Lieut. Ingles, West Yorkshire Regiment, almost abreast.

The leader maintained his advantage and won easily, but a series of small ditches in very holding ground proved too much for several of his followers on beaten horses, and with Captain Bigge, breaking a stirrup leather, and coming to grief in the river, and Captain Phillips at the railway, Lieut.-Colonel Adye, on his mare Cœurba, scored the maximum points for the R.A.

Lieut. Alderson, R.A. was third, and Captains Phillips and Bigge, who had quickly remounted, were placed next.

Mr. Charlie Larios therefore won the individual prize, while the R.A., with a total of 85 points took the Regimental one, the R.E. being next with 61.

The names of the R.A. placed in the first twenty officers are as follows :—

1st	Lieut.-Col. Adye on Cœurba	20 points.
2nd	Lieut. Alderson on Henry Clay	19 ,,
3rd	Captain Phillips on Pat	18 ,,
8th	Lieut. Seagram on The Goat	13 ,,
12th	Captain Jackson on Dusty Miller	9 ,,
15th	Lieut. Hall on Grey Friars	6 ,,
17th	Lieut. Street on The Sweep	0 ,,
18th	Lieut. Kœbel on Simon	0 ,,
19th	Lieut. Ruthven on Toddie	0 ,,
	Total	85 points.

General Richardson, R.A., officiated as judge, and there was a very large attendance of spectators, including His Excellency, Sir Robert Biddulph.

UMBALLA.

Regimental news from this station seems never to be recorded in the R.A.I. "Proceedings"—but it may not be without interest to those at home, who have friends or old associations connected with that place.

The cold weather was, as it annually is, well broken into by the two R.H.A. batteries having to march to Muridki Camp, close to Lahore, to carry out their practice. They left on 11th November and were back again on 6th January, 'F' Battery—just fresh from home—joined at Muridki as well, bringing the camp to three R.H.A. batteries with Colonel Eden in command. Shooting was decidedly good considering the difficult range Muridki is considered always to be. 'A' was only two or three places out of the prize list; 'H' somewhat lower down, whilst 'F' was not allowed to shoot in the competitive, having done so in England.

Polo has as usual been flourishing, eight gunners usually turning out. Before leaving Umballa for Muridki a local polo tournament was instituted for the first time, to be called the Sirhind Open Polo Tournament. There were excellent and keenly contested games throughout. Ten teams entered, viz:—four of 18th Hussars, 17th Bengal Cavalry, 60th Rifles, Queen's Regiment, Somerset Light Infantry and two R.H.A.—subaltern's team consisting of Bright (1), Sandys (2), Simpson-Baikie (3), Taylor (back), and a mixed team of Major Hawkins, Captain Watkins and Lieutenants Boulnois and Greathed.

The subaltern's team proved the winners, but not without plenty of hard play. Each player in the winning team got a small silver cup.

A team from Muridki, consisting of Bright (1), Gillson (2), Simpson-Baikie (3), Watkins (back), entered for the Punjaub Tournament at Lahore during Christmas week, but were just beaten in the first round by the Patiala second team. With more practice they should have rendered a good account of themselves. Our friends, the 18th Hussars, won this year. Umballa entered a gunners' team for the inter-regimental tournament in March, it consisted of Greathed (1), Bright (2), Simpson-Baikie (3), and Taylor (back), who were defeated in the first tie by 11th Hussars. Great things were not expected this year, but in time things will improve as ponies are collected together.

Shooting has somewhat given way to polo this cold season, but still some nice bags have been got by those who have been out; and considering the dryness of the year the bag got, marching to Muridki and back, doesn't show up badly.

On 30th January there was a very successful R.H.A. gymkhana, and all the station turned up. Good fields turned out for the four races as well as for the 'open race.' An N.-C.O's race finished up the afternoon.

There was an R.H.A. dance on 28th February in the club. As it was in the Native Cavalry polo week, and immediately preceding the race week, the station was quite full and quite 300 people turned up in the evening. It was in every way a great success and kept up with much spirit till well on into the 29th.

Since the end of January No. 1 Mountain Battery has been in camp close to the R.H.A. Lines and No. 3 battery, lately up in Chitral, arrived a month later. Both batteries have just left for the hills for the hot weather.

A rifle meeting has just been held in the district. The 'Chestnuts' won the Lloyd-Lindsay and Bombardier Pearce of 'H' made a possible 35 at 500 yards.

General Tyler finished his inspection during February, but the Inspector-General doesn't visit Umballa till early in April. After that there will be a good clearance, whilst several of us are meditating leave home.

OBITUARY

Lieutenant T. Jones, who died at Meerut, E.I., on 26th March, 1896, joined the Regiment as Second Lieutenant, 16th February, 1887, and became Lieutenant, 16th February, 1890. Lieutenant Jones served during the operations in Zululand in 1888.

Lieutenant H. T. Farquhar, who died at Cairo on 17th April, 1896, from the result of an accident whilst playing polo, was first commissioned as Second Lieutenant, 1st November, 1890, and became Lieutenant, 1st November, 1893.

Colonel G. B. Macdonell, who died suddenly at Glasgow, joined the Madras Artillery as 2nd Lieutenant 12th June, 1858; became Lieutenant, 27th August, 1858; Captain, 12th September, 1869; Major, 29th January, 1877; Lieut.-Colonel, 1st January, 1884, and Colonel, 1st January, 1888. Colonel Macdonell served in the Egyptian Expedition 1882. Despatches, *London Gazette*, 2nd November, 1882. Medal, bronze star, 3rd class Medjidie.

INTER-REGIMENTAL
RACKET AND BILLIARD MATCHES.

R.A. *v.* R.E.

Played at Chatham, March 30th and 31st, 1896.

DOUBLE RACKETS.

PLAYED AT 11 A.M., 31ST.

R.A.		R.E.
CAPTAIN A. M'N. COOPER-KEY. 2ND LIEUT. W. L. FOSTER.	beat	CAPTAIN J. E. HAMILTON. CAPTAIN W. C. HEDLEY.

1st Game.	*2nd Game.*	*3rd Game.*	*4th Game.*	*5th Game.*
R.A. 7.	R.A. 15.	R.A. 15.	R.A. 15.	R.A. 15.
R.E. 15.	R.E. 10.	R.E. 5.	R.E. 7.	R.E. 13.

SINGLE RACKETS.

FIRST PAIR PLAYED AT 2 P.M. 30th.

R.A.		R.E.
CAPTAIN A. M'N. COOPER-KEY.	beat	CAPTAIN J. E. HAMILTON.

1st Game.	*2nd Game.*	*3rd Game.*	*4th Game.*	*5th Game.*
R.A. 15.	R.A. 10.	R.A. 15.	R.A. 15.	R.A. 15.
R.E. 10.	R.E. 15.	R.E. 9.	R.E. 18.	R.E. 5.

The fourth game in this rubber was one of the longest and best ever seen in these matches.

SECOND PAIR PLAYED AT 3.30 P.M. 30TH.

2ND LIEUT. W. L. FOSTER. beat CAPTAIN W. C. HEDLEY.

1st Game.	*2nd Game.*	*3rd Game.*	*4th Game.*
R.A. 15.	R.A. 2.	R.A. 15.	R.A. 15.
R.E. 13.	R.E. 15.	R.E. 13.	R.E. 5.

The R.A. won all three events and keep the Cup through the ensuing year.

BILLIARDS.

THIRD PAIR PLAYED AT 5.30 P.M. 30TH.

R.A.		R.E.
LIEUT.-COL. W. L. DAVIDSON.	beat	CAPTAIN H. B. ROBERTS.
300.		276.
Best breaks 22, 21, 19, 18, 15, 14, 12, 11.		Best breaks 34, 17, 15, 15, 14, 13 10.

FIRST PAIR PLAYED AT 9.30 P.M., 30th.

MAJOR F. A. CURTEIS.	lost to	LIEUT. C. ST. B. SLADEN.
291.		300.
Best breaks 47, 27, 27, 24, 20, 18, 16, 16.		Best breaks 35, 28, 25, 22 21, 18, 10

THIRD PAIR PLAYED AT 11.15 P.M. 30TH.

LIEUT. C. A. SYKES, R.H.A.	lost to	LIEUT.-COL. A. R. E. DORWARD D.S.O.
281.		300.
Best breaks 30, 22, 21, 19, 19, 15, 14, 14, 12.		Best breaks 30, 27, 24, 23, 20, 14.

The R.E. won the odd event and take over the Cup for the ensuing year

R.A. & R.E. Annual Racket and Billiard Matches.

The results of the Racket and Billiard Matches up to and including the present year are shewn below :—

1873.

Rackets.		*Billiards.*	
Double. R.A. 1.	R.E. 4.	*Double.* R.A. 500.	R.E. 497.
Lieut. W. E. Denison.	Lieut. L. K. Scott.	Lieut.-Col. Drayson.	Capt. Seton.
" W. L. Davidson.	" S. M. Maycock.	Major Maitland.	" Mant.
Single. R.A. 2.	R.E. 3.	*Single.* R.A. 500.	R.E. 361.
eut. W. L. Davidson.	Lieut. S. M. Maycock.	Major Maitland.	Capt. Mant.

1874.

Rackets.		*Billiards.*	
Double. R.A. 4.	R.E. 1.	*Double.* R.A. 500.	R.E. 492.
Major Newman.	Lieut. L. K. Scott.	Major Maitland.	Capt. Warburton.
Lieut. Crookenden.	" Tower.	Lieut. Anstruther.	" Seton.
Single. R.A. 0.	R.E. 3.	*Single.* R.A. 370.	R.E. 500.
Lieut. Crookenden.	Lieut. Tower.	Major Maitland.	Capt. Warburton.

1875.

Rackets.		*Billiards.*	
Double. R.A. 0.	R.E. 4.	*Double.* R.A. 500.	R.E. 494.
Capt. Anderson.	Lieut. Tower.	Capt. Hazlerigg.	Major Warburton.
Lieut. Crookenden.	" *Hon.* M. G. Talbot.	Lieut. Anstruther.	Capt. Skinner.
Single. R.A. 0.	R.E. 3.	*Single.* R.A. 286.	R.E. 500.
Capt. Anderson.	Lieut. Tower.	Lieut. Anstruther.	Major Warburton.

1876.

Rackets.		*Billiards.*	
Double. R.A. 3.	R.E. 4.	*Double.* R.A. 500.	R.E. 451.
Major Murdoch.	Lieut. Penrose.	Capt. Hutchinson.	Major Warburton.
Lieut. Anstruther.	" Onslow.	Lieut. Anstruther.	Capt. Skinner.
Single. R.A. 1.	R.E. 3.	*Single.* R.A. 479.	R.E. 500.
Major Murdoch.	Lieut. Penrose.	Lieut. Anstruther.	Major Warburton.

1879.

Rackets.		*Billiards.*	
Double. R.A. 4.	R.E. 0.	*Double.* R.A. 500.	R.E. 430.
Capt. Griffiths.	Capt. L. K. Scott.	Major Hutchinson.	Major Seton.
Lieut. D. C. Carter.	Lieut. W. A. Cairnes.	Capt. Anstruther.	Capt. Glancy.
Single. R.A. 3.	R.E. 1.	*Single.* R.A. 500.	R.E. 421.
Lieut. D. C. Carter.	Lieut. W. A. Cairnes.	Capt. Anstruther.	Capt. Glancy.

1880.

Rackets.		*Billiards.*	
Double. R.A. 4.	R.E. 0.	*Double.* R.A. 500.	R.E. 430.
Lieut. King.	Lieut. R. S. Hedley.	Major Hutchinson.	Major Manderson.
" Cooper-Key.	" W. A. Cairnes.	Capt. Anstruther.	Capt. Glancy.
Single. R.A. 0.	R.E. 3.	*Single.* R.A. 458.	R.E. 500.
Lieut. D. C. Carter.	Lieut. W. A. Cairnes.	Capt. Anstruther.	Major Manderson.

1881.

Rackets.

Double. R.A. 4. R.E. 0.
Lieut. King. Lieut. S. M. Maycock.
" Cooper-Key. " W. A. Cairnes.
Single. R.A. 3. R.E. 1.
Lieut. Cooper-Key. Lieut. W. A. Cairnes.

Billiards.

Double. R.A. 500. R.E. 392.
Major Hutchinson. Capt. Glancy.
Capt. Anstruther. " Broadfoot.
Single. R.A. 500. R.E. 468.
Capt. Anstruther. Major Mant.

1882.

Rackets.

Double. R.A. 4. R.E. 2.
Lieut. C. D. King. Lieut. Tower.
" Cooper-Key. " Friend.
Single. R.A. 3. R.E. 1.
Lieut. Cooper-Key. Lieut. Tower.

Billiards.

Double. R.A. 300. R.E. 252.
Col. Maitland. Major Seton.
Lieut. Bruen. Major Glancy.
Single. R.A. 500. R.E. 437.
Col. Maitland. Major Seton.

1883.

Rackets.

Double. R.A. 1. R.E. 4.
Lieut. C. D. King. Lieut. Tower.
" Cooper-Key. " Friend.
Single. R.A. 1. R.E. 3.
Lieut. C. D. King. Lieut. Tower.

Billiards.

Double. R.A. 267. R.E. 300.
Col. Maitland. Lieut. Bor.
Capt. Anstruther. Lieut. Dumbleton.
Single. R.A. 500. R.E. 297.
Capt. Anstruther. Lieut. Dumbleton.

1884.

Rackets.

Double. R.A. 3. R.E. 4.
Lieut. Cooper-key. Lieut. Tower.
" C. D. King. " Friend.
Single. R.A. 2. R.E. 3.
Lieut. Cooper-Key. Lieut. Tower.

Billiards.

Double. R.A. 277. R.E. 300.
Lieut.-Col. Hazlerigg. Lieut. Dumbleton.
Capt. Anstruther. Capt. Digby.
Single. R.A. 500. R.E. 398.
Capt. Anstruther. Lieut. Dumbleton.

1885.

Rackets.

Double. R.A. 4. R.E. 2.
Lieut. Cooper-Key. Capt. Friend.
" C. D. King. Lieut. Hamilton.
Single. R.A. 3. R.E. 1.
Lieut. Cooper-Key. Capt. Friend.

Billiards.

Double. R.A. 300. R.E. 274.
Major Anstruther. Capt. Digby.
Capt. MacMahon. " Baddeley.
Single. R.A. 500. R.E. 248.
Major Anstruther. Capt. Digby.

1890.

Rackets.

Double. R.A. 1. R.E. 4.
Captain Cooper-Key. Lieut. Hedley.
Lieut. Simonds. " Sheppard.
Single. R.A. 0. R.E. 3.
Captain Cooper-Key. Lieut. Hedley.

Billiards.

Double. R.A. 235. R.E. 300.
Major Anstruther. Captain Digby.
Lieut. Lachlan. " Dumbleton.
Single. R.A. 500. R.E. 489.
Major Anstruther. Captain Dumbleton.

1891.

Rackets.

Double. R.A. 2. R.E. 4.
Captain Cooper-Key. Captain Hedley.
2nd Lieut. Galloway. 2nd Lieut. Sheppard.
Single. R.A. 3. R.E. 2.
Captain Cooper-Key. Captain Hedley.

Billiards.

Double. R.A. 300. R.E. 250.
Major Anstruther. Colonel Glancy.
Lieut. Pollock. Capt. Hedley.
Single. R.A. 444. R.E. 500.
Major Anstruther. Colonel Glancy.

1892.

Rackets.

Double. R.A. 4. R.E. 0.
Captain Cooper-Key. Captain Hamilton.
Lieut. & Capt. Quinton. Lieut. Blair.
Single. R.A. 3. R.E. 0.
Captain Cooper-Key. Captain Hamilton.

Billiards.

Double. R.A. 300. R.E. 291.
Captain Curteis. Colonel Glancy.
Captain Pollock. Captain Roberts.
Single. R.A. 500. R.E. 469.
Captain Pollock. Colonel Glancy.

1893.

Rackets.

Double. R.A. 4. R.E. 1.
Captain Cooper-Key. Captain Hamilton.
Lieut. & Capt. Quinton. Lieut. Blair.
Single. R.A. 2. R.E. 3.
Captain Cooper-Key. Captain Hamilton.

Billiards.

Double. R.A. 231. R.E. 300.
Major Curteis. Major Dorward, D.S.O.
Captain Pollock. Lieut. Jones.
Single. R.A. 500. R.E. 303.
Major Curteis. Major Dorward, D.S.O.

1894.

Rackets.

Double. R.A. 1. R.E. 4.
Captain Cooper-Key. Captain Hamilton.
Captain C. D. King. Lieut. Blair.
1 Single. R.A. 3. R.E. 1.
Captain Cooper-Key. Captain Hamilton.
2 Single. R.A. 0. R.E. 3.
Lieut. Quinton. Lieut. Blair.

Billiards.

1 Single. R.A. 255. R.E. 300.
Captain Vans-Agnew. Major Dorward, D.S.O.
2 Single. R.A. 285. R.E. 300.
Major Curteis. Lieut. Jones.
3 Single. R.A. 300. R.E. 134.
Captain Lachlan. Major Ruck.

1895.

Rackets.

Double. R.A. 3. R.E. 4.
Captain Cooper-Key. Captain Hamilton.
Lieut. Quinton. Lieut. Blair.
1 Single. R.A. 3. R.E. 2.
Captain Cooper-Key. Captain Hamilton.
2 Single. R.A. 3. R.E. 2.
Lieut. Perkins. Lieut. Blair.

Billiards.

1 Single. R.A. 300. R.E. 210.
Captain Lachlan. Lieut.-Col. Dorward.
2 Single. R.A. 288. R.E. 300.
Lieut. Seligman. Captain Dumbleton.
3 Single. R.A. 300. R.E. 297.
Major Curteis. Lieut. Sladen.

1896.

Rackets.

Double. R.A. 4. R.E. 1.
Captain Cooper-Key. Captain Hamilton.
2nd Lieut. Foster. Captain Hedley.
1 Single. R.A. 3. R.E. 2.
Captain Cooper-Key. Captain Hamilton.
2 Single. R.A. 3. R.E. 1.
2nd Lieut. Foster. Captain Hedley.

Billiards.

1 Single. R.A. 291. R.E. 300.
Major Curteis. Lieut. Sladen.
2 Single. R.A. 281. R.E. 300.
Lieut. Sykes, R.H.A. Lieut.-Col. Dorward.
3 Single. R.A. 300. R.E. 276.
Lieut.-Col. Davidson. Captain Roberts.

DIARY OF FIXTURES.

MAY.

Day of the Mth.	Wk.	Regimental.	Cricket, &c,	Private.
1	F	... ...	... ...	... ...
2	S	1st Division joins at Golden Hill. 1st Division (R.H.A. mixed) reaches Shoeburyness.	R.A. Woolwich *v.* Lessness Park at Abbey Wood.	... ...
3	S	... ...	... ...	... ...
4	M	... ...	... ...	... ...
5	T	... ...	... ...	... ...
6	W	... ...	R.A. Woolwich *v.* Lincoln Regt. at Woolwich.	... ...
7	Th	... ...	... ...	... ...
8	F	... ...	... ...	... ...
9	S	1st Division (F.A. Aldershot) reaches Okehampton. 2nd Division (F.A. Weedon) reaches Shoeburyness.	R.A. Woolwich *v.* Shoebury at Shoebury.	... ...
10	S	... ...	. . ...	... ...
11	M	... ...	... ...	'Ubique' Lodge meets at "Criterion." Installation of W.M. and Banquet.
12	T	... ...	Newmarket 2nd Spring begins	... ...
13	W	... ...	R.A. Woolwich *v.* Granville at Woolwich.	... ...
14	Th	... ...	... ...	... ...
15	F	... ...	... ...	... ...
16	S	3rd Division (F.A. mixed) reaches Shoeburyness.	R.A. Woolwich *v.* N.-C.O's. at Woolwich.	... ...
17	S	... ...	... ...	... ...
18	M	... ...	... ...	... ...
19	T	.. ...	R.A. Woolwich *v.* Blackheath at Blackheath.	... ...
20	W	... ...	... ...	... ...
21	Th	... ...	... ...	... ...
22	F	... ...	R.A. *v.* Aldershot Division at Aldershot.	... ...
23	S	2nd Division joins at Golden Hill. 4th Division (F.A. Woolwich) reaches Shoeburyness.	R.A. *v.* Aldershot Division at Aldershot.	... ...
24	S	Whit Sunday.	... ...	... ...
25	M	Bank Holiday.	R.A. Woolwich *v.* R.M.A. at R.M.A.	... ...
26	T	... ...	... ...	... ...
27	W	... ...	R.A. Woolwich v. Charlton Park at Charlton.	... ...
28	Th	... ...	... ...	... ...
29	F	... ...	R.A. *v.* Eton Ramblers at Woolwich.	... ...
30	S	5th Division (R.H.A. Woolwich) reaches Shoeburyness.	R.A. *v.* Eton Ramblers at Woolwich.	... ...
31	S	... ...	... ...	... ...

JUNE.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	M	... ...	R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
2	T	... ...	Epsom begins. R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
3	W	... ...	Derby. R.A. Woolwich *v.* R.N. College at Blackheath.	... ...
4	Th	2nd Division (R.H.A. Aldershot) reaches Okehampton.	... ...	Annual Dinner of the Chestnut Tooop, R.H.A. (apply to Cap. Headlam, Okehampton)
5	F	... ...	Oaks.	... ...
6	S	6th Division (F.A. Aldershot) reaches Shoeburyness.	R.A. Woolwich *v.* Shoebury at Woolwich.	... ...
7	S	... ...	... ...	... ...
8	M	... ...	... ...	'Ubique' Royal Arch Chapter meets at "Criterion." Installation of Principals.
9	T	... ...	... ...	... ...
10	W	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
11	Th	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
12	F	Annual General Meeting of R.A.I. at R.U.S.I. at 3 p.m	REGIMENTAL DINNER. R.A. *v.* B.B. at Woolwich.	...
13	S	7th Division (F.A. Woolwich) reaches Shoeburyness.	R.A. *v.* B.B. at Woolwich.	... ...
14	S	... ...	... ...	.. ...
15	M	... ...	... ...	... ...
16	T	... ...	Ascot begins.	... ...
17	W	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	F	... ...	R.A. *v.* R.E. at Chatham.	...
20	S	3rd Division joins at Golden Hill.	R.A. *v.* R.E. at Chatham.	... ...
21	S	... ...	... ...	... ...
22	M	... ...	R.A. Woolwich *v.* Granville at Lee.	... ...
23	T	... ...	... ...	... ...
24	W	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
25	Th	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
26	F	... ...	... ...	... ...
27	S	1st Division (F.A. Newcastle) reaches Church Stretton.	... ...	... ...
28	S	... ...	... ...	... ...
29	M	... ...	... ...	... ...
30	T	... ...	Newmarket 1st July begins.	... ...

JULY.

1	W	3rd Division (F.A. Exeter) reaches Okehampton.	... ...	... ...
2	Th	... ...	Oxford *v.* Cambridge.	... ...
3	F	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
4	S	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
5	S	... ...	... ...	... ...
6	M	... ...	... ...	... ...
7	T	... ...	... ...	... ...
8	W	... ...	... ...	... ...
9	T	... ...	... ...	... ...
10	F	... ...	Eton *v.* Harrow.	... ...
11	S	2nd Division (F.A. Sheffield) reaches Church Stretton.	Eton *v.* Harrow.	... ...

JULY.—*Continued.*

Day of the Mth.	Wk	Regimental.	Cricket, &c.	Private.
12	**S**	... ...	... ...	... ...
13	M	... ...	R.A. *v.* Harlequins at Woolwich.	... ...
14	T	... ...	R.A. *v.* Harlequins at Woolwich.	... ...
15	W	... ...	R.A. *v.* Linton Park at Linton.	... ...
16	Th	4th Division (F.A. Woolwich) reaches Okehampton.	R.A. *v.* Linton Park at Linton.	'Ubique' Mark Lodge of Mark Master Masons meets at "Criterion." Installation of W.M.
17	F	... ...	... ...	... ...
18	S	Long Course joins at Golden Hill.	R.A. Woolwich *v.* Blackheath at Woolwich.	... ...
19	**S**	... ...	... ...	... ...
20	M	... ...	... ...	... ...
21	T	... ...	... ...	... ...
22	W	... ...	R.A. *v.* Greenjackets at Winchester.	... ...
23	Th	... ..	R.A. *v.* Greenjackets at Winchester.	... ...
24	F	... ...	R.A. *v.* R.E. at Woolwich.	... ...
25	S	... ...	R.A. *v.* R.E. at Woolwich.	... ...
26	**S**	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	... ...	... ...
29	W	... ...	... ...	... ...
30	Th	... ...	... ...	... ...
31	F	... ...	R.A. *v.* Free Foresters at Woolwich.	... ...

AUGUST.

1	S	... ...	R.A. *v.* Free Foresters at Woolwich.	... ...
2	**S**	... ...	... ...	... ...
3	M	... ...	R.A. *v.* Authentics at Woolwich.	... ...
4	T	... ...	R.A. *v.* Authentics at Woolwich.	... ...
5	W	... ...	R.A. *v.* I. Zingari at Woolwich.	... ...
6	Th	... ...	R.A. *v.* I. Zingari at Woolwich.	... ...
7	F	... ...	... ...	... ...
8	S	... ...	... ...	... ...
9	**S**	... ...	... ...	... ...
10	M	... ...	... ...	... ...
11	T	5th Division (F.A. Ipswich) reaches Okehampton.	... ...	... ...
12	W	... ...	R.A. Woolwich *v.* Lincoln Regt. at Woolwich.	... ...
13	Th	... ...	... ...	... ...
14	F	... ...	R.A. Woolwich *v.* West Kent at Woolwich.	... ...
15	S	4th Division joins at Golden Hill.	R.A. Woolwich *v.* Fernwood at Woolwich.	... ...
16	**S**	... ...	... ...	... ...
17	M	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	W	... ...	R.A. Woolwich *v.* Charlton Park at Woolwich.	... ...
20	Th	... ...	... ...	... ...
21	F	... ...	... ...	... ...
22	S	... ...	R.A. Woolwich *v.* Lessness Park at Woolwich.	... ...
23	**S**	... ...	... ...	... ...
24	M	... ...	R.A. Woolwich *v.* West Kent at Woolwich.	... ...

AUGUST.—*Continued.*

Day of the Mth.	Wk.	Regimental.		Cricket, &c.		Private.	
25	T	...	...	...	...	...	...
26	W	...	...	...	...	...	...
27	Th	...	...	...	...	...	...
28	F	...	...	...	...	...	...
29	S	...	...	R.A. Woolwich *v.* N.-C.O's. at Woolwich.		...	...
30	S	...	...	...	...	...	...
31	M	...	...	...	...	...	...

SEPTEMBER.

1	T	...	...	...	...	...	...
2	W	...	...	...	...	...	...
3	Th	...	...	...	...	...	...
4	F	...	...	...	...	...	...
5	S	...	...	...	...	...	...
6	S	...	...	...	...	...	...
7	M	...	...	...	...	...	...
8	T	...	...	...	...	...	...
9	W	...	...	...	...	...	...
10	Th	...	...	...	...	...	...
11	F	...	...	...	...	...	...
12	S	...	...	...	...	...	...
13	S	...	...	...	...	...	...
14	M	...	...	...	...	...	...
15	T	...	...	...	...	...	...
16	W	...	...	...	...	...	...
17	Th	...	...	...	...	...	...
18	F	...	...	...	...	...	...
19	S	...	...	...	...	...	...
20	S	...	...	...	...	...	...
21	M	...	...	...	...	...	...
22	T	...	...	...	...	...	...
23	W	...	...	...	...	...	...
24	Th	...	...	...	...	...	...
25	F	...	...	...	...	...	...
26	S	...	...	...	...	...	...
27	S	...	...	...	...	...	...
28	M	...	...	...	...	...	...
29	T	...	...	...	...	...	...
30	W	...	...	...	...	...	...

NOTES

FROM

CORRESPONDING MEMBERS.

As a great many applications have been received for supply of copies of "Field Artillery Drill, 1896," the following remark of the Controller, H.M. Stationery Office, is published for the information of those who have applied: "The 1896 edition is only in the *proof* stage—and is not likely to be ready for some time."

The following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

"The Shrapnel Fire of the Field Artillery" by Major-General Rohne. Translated by Colonel N. L. Walford, price 2s. 6d.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the five examinations ending November 1895:—

Captains (*c*) and (*d*) ... ... price 1s. 1d.
Lieutenants (*c*), (*d*) and (*e*) ... price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

Order of Merit of Field Batteries in Preliminary Competition for Royal Military Tournament.

No. of Battery.	Station.	Order of Merit.	
30th	Colchester	1	Recommended for R.M.T.
75th	Bristol	2	
52nd	Weedon	3	
87th	Woolwich	4	
62nd	Ipswich	5	
69th	Weedon	6	
18th	Exeter	7	
58th	Woolwich	8	
14th	Ipswich	9	
65th	Hilsea	10	
37th	Hilsea	11	
13th	Aldershot	12	
80th	Woolwich	13	
86th	Woolwich	14	
57th	Woolwich	15	
84th	Woolwich	16	
12th	Hilsea	17	

R.A. *v.* R.E. GOLF MATCHES.

These matches were played over the links of the St. George's Club, Sandwich on Tuesday, 28th April and resulted in a victory for the Royal Engineers by six holes up.

Thanks are due to the Committee and Members of the St. George's Club for placing their links at the disposal of the players.

Result of matches:—

R.A.		R.E.	
Singles.			
2nd Lieut. W. L. Foster	0	Capt. H. N. Dumbleton	0
Major H. A. Scott	0	Major R. M. Ruck	1
Capt. A. L. Molesworth	3	Lieut. R. S. Walker	0
Lt.-Col. H. H. Crookenden	0	Lieut. A. H. Dumaresq	2
2nd Lieut. A. C. Russel	3	Capt. H. Broke	0
Capt. F. B. Johnstone	2	Lieut. E. A. Cumming	0
Major L. E. Coker	0	Lieut. C. W. Gwynn, D.S.O.	6
2nd Lieut. H. R. Peck	0	Lieut. C. St. B. Sladen	6
	8		15
Foursomes.			
2nd Lieut. W. L. Foster Major H. A. Scott	1	Captain H. N. Dumbleton Major R. M. Ruck	0
Capt. A. L. Molesworth Lt.-Col. H. H. Crookenden	2	Lieut. R. S. Walker Lieut. A. H. Dumaresq	0
2nd Lieut. A. C. Russel Capt. F. B. Johnstone	0	Capt. H. Broke Lieut. E. A. Cumming	6
Major L. E. Coker 2nd Lieut. H. R. Peck	4	Lieut. C. W. Gwynn, D.S.O. Lieut. C. St. B. Sladen	0
	7		6

The R.A. Institution have copies of the undermentioned works bound in cloth, which can be bought by members at the price of 1s. each:—

Colonel Walford's Translation of Prince Kraft's Letters on Infantry.
35 copies.

Colonel Walford's Translation of Prince Kraft's Letters on Cavalry.
18 copies.

They are the copies as published in Translations with the "Proceedings" and should be useful to members who have joined since the date of their publication.

PLYMOUTH.

The Royal Artillery quartered in the Plymouth Fortress have just given two successful entertainments here. On April 28th the R.A. Band, 50 performers, under Cav. Zavertal, came down and played a charming programme in their best style. The concert was at 3 p.m. so as to enable people to come in from the country for it, and the splendid Guildhall at Plymouth was filled with a most appreciative audience. All were asked at the invitation of Colonel Walkey and the officers, and at the conclusion of the concert, tea was provided at two tables which extended the full length of the hall within the arcades. It is reckoned that there must have been some 1200 people present, including 200 of our own warrant officers and sergeants and their families, as well as the Band-masters and some of the senior warrant officers in garrison.

The programme was so well received that Cav. Zavertal kindly gave two encores. It would be invidious to name any particular pieces as being especially commended, but the magnificent rendering of the selection from Tannhaüser, and Cav. Zavertal's Alpengluhen were loudly applauded, as were the cornet solo by Musician Ellis in "I'll sing thee songs of Araby" and the euphonium solo by Sergeant Parsons in "Vorrei morire," Tosti.

As the Guildhall was crammed with people it was naturally a matter of some anxiety as to how they were all to get their tea. The committee, however, were able, with the assistance of a fatigue party, to close up rows of chairs, and so leave space for circulation, and the result was quite satisfactory.

The instant the guests had left the concert-room operations were commenced for preparing it for the ball of the 30th, and the time available was none too long. A special dancing floor was laid by Messrs Parkhouse & Co., of Plymouth, who did all the decorating and furnishing, and the place was gradually transformed into a beautiful and spacious ball-room, the arcades and gallery and other rooms being converted into sitting out rooms, prettily furnished; floral decorations of all kinds were largely used. Opening off the Guildhall was a large marquee to seat 220 people at once. This marquee was floored and carpeted and lined throughout with a green and red striped material which lit up well. In the centre was a long buffet table decorated with mess plate and lovely flowers, many of which were sent by friends of the officers from Cornwall. The floral decorations generally were by Messrs Hender, of Mannamead. Conspicuous in the centre of the buffet was the splendid Bombay cup kindly lent by the R.A. Mess, Woolwich, flanked by two other large cups and a number of smaller articles of plate, some belonging to the R.A. Mess, and others being trophies won for good shooting in India by 13th Company, Western Division. Supper was served at about 50 small tables, each lighted by a lamp with lovely silk and lace shade. As there were some 50 or 60 of these lamps the general effect of colour was very striking. The supper by Messrs Matthews, of Plymouth, was most satisfactory.

Mrs. Williams, wife of Colonel R. F. Williams, R.A., in the absence of Mrs.

Walkey, received the guests who numbered near 800, and included the Naval Commander-in-Chief and Lady Lyons, Lieut.-General Sir F. W. Forestier-Walker and Lady Walker, civil dignitaries, local gentry, and many of the county families, besides all the naval and military society of the station and neighbourhood.

Dancing commenced at 10 and continued till 4 a.m., to the strains of the R.A. Band, who played perfectly, under the leadership of Sergt.-Major Sugg.

The arrangements were under a committee consisting of Lieut.-Colonel Dalton, R.A., as president, Major A. H. Callwell (who unfortunately had to leave on transfer for India just before the concert), Captains the Hon. R. Mostyn, and H. C. Molesworth, and Lieut. Hanna, with Capt. J. Lewes as an indefatigable secretary.

Lovely weather favoured us all the time and was an important factor in contributing to the success of the entertainments.

We must not forget to mention that the ball programme included two valses, one by Mr Moline, brother-in-law of Major Haines, R.A., called "Moulin à Vent" and the other by Capt. C. O. Smeaton, R.A., called "Mine is Thine." Both were good and we were glad to see the author of the latter present to receive the congratulations of his friends.

The Dalton Golf Challenge Cup was played for on Wednesday, 6th May. The conditions of this cup are that it shall be played for annually under strict rules of Medal Play (handicap) by officers R.A. actually serving in Plymouth Garrison and members of the Head-Quarter Mess. It was presented last year by Colonel Dalton and, as may be remembered, was won on the first occasion by Major Mansel with the good score of 93 — 4 = 89. It was played for on that occasion to the accompaniment of hail-storms. On the present occasion the weather overhead was all that could be desired, but the absence of rain, and the north and east winds of the last five weeks had rendered the putting greens fast, lumpy and unreliable, and lies in caps and ruts almost unplayable.

This may in part account for the success of the long handicap men, without, however, detracting from the merit of the score of the winner, Mr. C. A. Ker, whose return journey of 52 was a very steady and level performance.

Subjoined are the returns: —

Mr. C. A. Ker	112	— 27	= 85
„ G. H. Riach	116	— 30	= 86
„ H. G. Pringle	94	— 5	= 89
Captain Robinson	103	— 12	= 91
Mr. E. H. Chamier	104	— 12	= 92
Captain Hon. R. Mostyn	96	— 4	= 92
Major Nicolls	99	— 4	= 95
Captain A. L. Molesworth	97 (scr.)		= 97
Mr. H. C. Godfray	116	— 18	= 98

Eleven other competitors made no returns or over 100.

Major Mansel was unfortunately unable to compete through ill health.

Mr. Pringle's score was the feature of the competition and the development of this young golfer's play should be watched.

Score out 5, 6, 4, 6, 6, 5, 4, 6, 6 = 48.
„ in 5, 5, 4, 7, 6, 5, 4, 5, 5 = 46.

Captain Mostyn's outward journey of 45, the best score for nine holes, promised better things.

The opening cricket match of the season was played on May 12th *v.* R.M.L.I. at Mount Wise, the R.A. winning easily. Lieut. Ker distinguished himself by making 102 not out, Lieuts. Alexander and Westropp also played useful innings. Captain Parker of the Marines was the only one who could make any stand against the bowling of Sergeant Bates and Gunner Fleming.

On May 18th the R.A. played the 2nd Battalion Gloucestershire Regiment and were again successful. The scores were not large, but the match was none the less interesting. We seem likely to have a good team this year, some of the young entry being very promising.

The Inspector-General of Ordnance, Lieut.-General Markham, R.A., accompanied by Major H. C. Sclater, R.A., has lately paid us a visit of inspection, and was favoured with perfect weather for going round the works.

There have been numerous changes here amongst the officers. We were sorry to lose Lieut.-Colonel and Mrs. Bingham, who have gone to Melbourne where he takes up an important appointment. Major Perrott has succeeded him as Commandant of the School of Gunnery here. Major A. H. Callwell has left on exchange with Major Talbot. Major Kent and Captain Baldwin have come to the depot, Captain Tawney to 21 Company in place of Captain Worsley gone to Malta, Major Nicholls and Captain Stanford replace Major Hickman and Captain Lyon in 15 Company. Major Fegen has taken Lieut.-Colonel Western's place in 17 Company.

15 Company goes to Lydd on 19th June next for its annual practice, and Lieut.-Colonel Dalton goes from here to Lydd to command the Second Division in the practice camp.

DIARY OF FIXTURES.

JUNE.

Day of the Mth.	Wk.	Regimental.	Cricket, &c.	Private.
1	M	... ...	R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
2	T	... ...	Epsom begins. R.A. *v.* Gentlemen of M.C.C. at Lords.	... ...
3	W	... ...	Derby. R.A. Woolwich *v.* R.N. College at Blackheath.	... ...
4	Th	2nd Division (R.H.A. Aldershot) reaches Okehampton.	... ...	Annual Dinner of the Chestnut Tooop, R.H.A. (apply to Cap. Headlam, Okehampton)
5	F	... ...	Oaks.	... ...
6	S	6th Division (F.A. Aldershot) reaches Shoeburyness.	R.A. Woolwich *v.* Shoebury at Woolwich.	... ...
7	S	... ...	... ...	... ...
8	M	... ...	... ...	'Ubique' Royal Arch Chapter meets at "Criterion." Installation of Principals.
9	T	... ...	... ...	... ...
10	W	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
11	Th	... ...	R.A. *v.* Quidnuncs at Woolwich.	... ...
12	F	Annual General Meeting of R.A.I. at R.U.S.I. at 3 p.m	REGIMENTAL DINNER. R.A. *v.* B.B. at Woolwich.	...
13	S	7th Division (F.A. Woolwich) reaches Shoeburyness.	R.A. *v.* B.B. at Woolwich.	... ...
14	S	... ...	... ...	... ...
15	M	... ...	... ...	... ...
16	T	... ...	Ascot begins.	... ...
17	W	... ...	... ...	... ...
18	T	... ...	... ...	... ...
19	F	... ...	R.A. *v.* R.E. at Chatham.	...
20	S	3rd Division joins at Golden Hill.	R.A. *v.* R.E. at Chatham.	... ...
21	S	... ...	... ...	... ...
22	M	... ...	R.A. Woolwich *v.* Granville at Lee.	... ...
23	T	... ...	... ...	... ...
24	W	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
25	Th	... ...	R.A. *v.* Yorkshire Gentlemen at Woolwich.	... ...
26	F	... ...	... ...	... ...
27	S	1st Division (F.A. Newcastle) reaches Church Stretton.	... ...	... ...
28	S	... ...	... ...	... ...
29	M	... ...	... ...	... ...
30	T	... ...	Newmarket 1st July begins.	... ...

JULY.

Day of the Mth	Wk	Regimental.	Cricket, &c.	Private.
1	W	3rd Division (F.A. Exeter) reaches Okehampton.	... ...	... ...
2	Th	... ...	Oxford *v.* Cambridge.	... ...
3	F	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
4	S	... ...	Oxford *v.* Cambridge. R.A. *v.* Household Brigade at Chelsea.	... ...
5	S	... ...	... ...	... ...
6	M	... ...	... ...	... ...
7	T	... ...	... ...	... ...
8	W	... ...	... ...	... ...
9	T	... ...	... ...	... ...
10	F	... ...	Eton *v.* Harrow.	... ...
11	S	2nd Division (F.A. Sheffield) reaches Church Stretton.	Eton *v.* Harrow.	... ...
12	S	... ...	... ...	... ...
13	M	... ...	R.A. *v.* Harlequins at Woolwich.	... ...
14	T	... ...	R.A. *v.* Harlequins at Woolwich.	... ...
15	W	... ...	R.A. *v.* Linton Park at Linton.	... ...
16	Th	4th Division (F.A. Woolwich) reaches Okehampton.	R.A. *v.* Linton Park at Linton.	'Ubique' Mark Lodge of Mark Master Masons meets at "Criterion." Installation of W.M.
17	F	... ...	... ...	... ...
18	S	Long Course joins at Golden Hill.	R.A. Woolwich *v.* Blackheath at Woolwich.	... ...
19	S	... ...	... ...	... ...
20	M	... ...	... ...	... ...
21	T	... ...	... ...	... ...
22	W	... ...	R.A. *v.* Greenjackets at Winchester.	... ...
23	Th	... ...	R.A. *v.* Greenjackets at Winchester.	... ...
24	F	... ...	R.A. *v.* R.E. at Woolwich.	... ...
25	S	... ...	R.A. *v.* R.E. at Woolwich.	... ...
26	S	... ...	... ...	... ...
27	M	... ...	... ...	... ...
28	T	... ...	... ...	... ...
29	W	... ...	... ...	... ...
30	Th	... ...	... ...	... ...
31	F	... ...	R.A. *v.* Free Foresters at Woolwich.	... ...

NOTES

FROM

CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1897.

The Subject approved by H.R.H. The Colonel-in-Chief for the "Duncan" Gold Medal Prize Essay, 1897, is as follows:—

"Coast Artillery Practice; how best to conduct it with a view to the requirements of actual warfare."

The Rules for the Prize Essays now read:—

The Annual Gold Medal, when awarded, to be accompanied by an *honorarium* of £20; the Silver Medal by an *honorarium* of £10.

The candidates must be Officers of the Regiment who are members of the R.A. Institution.

Officers are requested to confine their Essays to about 16 printed pages of the "Proceedings;" other things being equal brevity will count towards success.

The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each Essay must be *type-written* in triplicate. The Essays must be strictly annoymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the competition has been announced, and he will send the writers the money for their type-writing expenses.

The Committe will allow a sum of £1 for type-writing each Essay.

The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend:—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
3. That no Medal be awarded.

The names of the successful candidates will be announced at the Annual Meeting, and Medallists will be distinguished as such in all Lists, &c., issued from the

Institution; and in the event of a University man gaining a Medal, a report of his success will be made to the University of which he may be a member.

The successful Essays will be printed and circulated to members by the Institution.

N.B.—The Committee draw particular attention to the paragraph in the Rules above on the subject of length of Essays; it is not difficult to discover the number of words in an average page of "Proceedings" matter, and so to keep an Essay within the 16 pages' limit.

Colonel Walford's Translation of Prince Kraft's Letters on Infantry.
do do do do on Cavalry.
These are the copies as published in Translations with the "Proceedings" and should be useful to members who have joined since the date of their publication, price, 1s. each.

A Correspondent writes:—

"THERE is often a slight confusion caused in the drill of a battery by the fact that the administrative titles of the sections and numbers of the sub-divisions are the same as those used on parade, where the relative positions of the sections are frequently changed. A man who is accustomed to be always in No. 6 sub-division does not readily recognize that he has suddenly come into action as No. 2 gun.

This could be easily remedied by following the practice of the cavalry and infantry, and calling the sections in barracks *A*, *B*, *C*, the sub-divisions *A1*, *A2*, *B1*, *B2*, *C1*, *C2*. There could then be no possible confusion between right, centre and left sections, 1, 2, 3, 4, 5 and 6 sub-divisions, on parade. The approaching issue of a new Field Artillery drill-book suggests a hope that this might be considered for possible adoption therein."

AT the recent Irish Military Tournament during "the combined display of all arms," a second round of blank was being loaded when some burning shreds from the previous round ignited it, with the result that the right arm of Gunner Light, "Q," R.H.A., was blown off and Sergeant Hart, also of "Q," received the full force of the explosion in his face. They were both taken to hospital and operated on, and the following conversation was overheard when they had recovered from the effects of the chloroform, "Well, sergeant, I have lost my arm." "Aye, indeed," said the sergeant, "and I am sorry for it, and I have lost one eye, and don't know whether I'll have much light in the other. Well, never mind, old man! Buck up! We belong to the Royal Horse Artillery!" "Aye, so we do," said the gunner, with an air of perfect satisfaction. This splendid example of *esprit de corps* in its truest sense was quoted by Lord Roberts, in a speech at a public banquet in Dublin, and is noted here to secure a record of it and as a subject of interest to the Regiment generally.

R.A. POINT-TO-POINT RACES.

The following remarks are addressed by Captain C. G. Mackenzie, R.A., Coventry, to the officers of the Regiment at large; he is Hon. Secretary to the stewards of the Regimental point-to-point races, he publishes below a statement of accounts and a correspondence between the stewards and himself which shows their opinions on the questions at issue.

Statement of Accounts R.A. Point-to-Point Steeplechases, 1896.

Dr. **Cr.**

		£	s.	d.
17th Oct.	Printing...	3	0	0
20th Feb.	Postage, etc.	2	0	0
1st March.	Weatherby Certificate ...	0	10	0
1st April.	3 Prizes Farmers Races ...	27	10	0
,,	6 Prizes R.A. Races	35	0	0
,,	Present J. Darby, Esq. ...	8	2	0
,,	Luncheon Exs. Weedon and Coventry	2	0	6
,,	Damage and expenses of Course	13	5	0
,,	Marquee	3	10	0
,,	N. Warwick Hunt Servants	2	0	0
		96	17	6
	Balance Credit	26	18	1
	Total	123	15	7

	£	s.	d.
Balance last Account	54	1	9
D, R.H.A....	1	5	0
P, ,, ...	2	0	0
U, ,, ...	1	0	0
63rd, R.A.	1	0	0
82nd ,, ...	1	15	0
86th ,, ...	1	0	0
77th ,, ...	1	5	0
19th ,, ...	2	5	0
20th ,, ...	2	6	10
Depot Field	1	5	0
30th, R.A....	1	10	0
38th ,, ...	1	15	0
81st ,, ...	1	0	0
87th ,, ...	1	0	0
4th ,, ...	3	0	0
84th ,, ...	1	10	0
52nd ,, ...	1	5	0
69th ,, ...	1	5	0
75th ,, ...	1	0	0
58th ,, ...	1	0	0
3rd ,, ...	1	4	0
85th ,, ...	1	5	0
80th ,, ...	1	0	0
2 Depot, Western	1	11	0
19th Company, Eastern...	1	0	0
12th Company, Western	1	1	0
Lieutenant Aldridge	0	5	0
Captain Jenkinson	0	5	0
Lieutenant M. S. Williams	0	10	0
,, Vallentin	0	10	0
Major Blewitt	1	0	0
Captain Denne...	0	5	0
,, Powell	0	10	0
Major Curteis	0	10	0
Lieut.-Colonel Yorke	0	10	0
Major Barlow	0	10	0
Lieut.-Colonel Josselyn...	0	10	0
Lieutenant Probyn...	0	10	0
,, Montgomery	0	10	0
Captain W. Paget	1	0	0
,, Staveley	0	5	0
Colonel Lockhart	0	10	0
Lieut.-Colonel Davidson	0	10	0
,, Curling	1	0	0
Captain N. Birch	1	0	0
,, Dawkins	1	1	0
Lieutenant A. Birch	0	10	0
,, Hankey...	0	10	0
Major Carter	0	5	0
Colonel Wallace	0	10	0
Captain Ferrar...	0	10	0
Major Keir	1	0	0
Lieutenant Budworth	1	0	0
Entries	17	10	0
Total	123	15	7

(Signed), C. G. MACKENZIE, Captain,

Secretary R.A. Point-to-Point.

Dear Colonel.—

I enclose a statement of accounts of point-to-point, a copy of which you have already received. From it you will see that the balance has decreased from £54 to about £27—nearly one half. At this rate one more year would bring the fund into debt. You will see that only £52 was subscribed by the Regiment this year. This was due, I fancy, partly to an idea that we were rolling in funds. I certainly did try to discourage anyone being called on for a large individual subscription, hoping that by everyone interested in hunting giving a little, no one would feel the amount. 1. Secretary.

This idea has not been a success, and I think the committee will have to devise some other means of financing the races.

The expenses this year, though more than the first, cannot be said to be at all abnormal. More than was intended (through a mistake, I believe) was given to the farmers' races, but the expenses for keeping the course and damages are not excessive.

To do the thing properly and keep a bit in hand against a rainy day, I think one ought to count on a subscription of £100 per annum, exclusive of entries. I would suggest this being raised by sending out orders on Messrs. Cox & Co., payable on 1st January each year to all officers—something of this kind :—

"Messrs. Cox & Co.—

Please place to credit of R.A. point-to-point fund the sum of £ s. d. on the 1st January each year until further instructions.

A. B.,

Lieut., R.A."

The Secretary would then know in time how much money he had to play with, and could arrange accordingly. If you or any other member of the committee have any other suggestion to make would you kindly do so on this paper, and return to me ?

Yours Sincerely,

C. G. Mackenzie,

Captain, R.A.,

Hon. Sec. R.A. Point-to-Point.

Aldershot,

19th June, 1896.

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2. Col. Wallace Senior Steward.

I think we might try the suggestion of an order being given on Messrs. Cox & Co., but I doubt it being successful, an appeal to batteries would have also to be made, and I doubt this being popular.

For the conditions, I would restrict riders to one race only, either heavy or light-weight.

R. H. Wallace,

Lieut.-Colonel, R.H.A. and Colonel.

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3. Lieut.-Col. O'Malley.

It would, I think, simplify matters much if forms for authorising annual payment of subscription by Messrs. Cox & Co. were issued.

I would suggest the 1st November as a better date than 1st January.

G. O'Malley,

Lieut.-Colonel, R.A.

21st June, 1896.

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4. Major Eustace.

I think the circular might be tried and agree with Colonel O'Malley that 1st November is a better date. In this case a circular would have been sent by Messrs. Cox & Co. to every officer of the Regiment if possible, and I should say on it that the smallest sum would be thankfully received.

If half the Regiment averaged 5s. or even 2s. 6d. it would give, I think, over £100 in the latter case even.

St. John's Wood Barracks,

22nd June, 1896.

F. Eustace,

Major, R.A.

P.S.—I think riders should be restricted to one race only.

6
Capt. Paget.

I think the plan of sending round a circular is worth trying, and should lay stress on the fact that any donation, however small, would be thankfully received, and I agree with Major Eustace and Colonel O'Malley that 1st November is the better date. I would suggest that the Games' Fund be asked to give £50 for purchasing two challenge cups—one for light and one for heavy-weight race, value £25 each.

I am strongly of opinion that no one should be allowed to ride in both classes.

As long as funds are forthcoming, I don't think £27 10s. too much to give to the farmers' races.

I think an effort should be made to get a course as straight as possible, so as to avoid as many flags as we had this year, to comply with the spirit as well as to letter of the G.N.H. Rules.

Woolwich, W. L. Paget,

23rd June, 1896. Captain, R.H.A.

6.
Capt J. L. Smith.

I agree with the proposal to send out circulars with orders on Messrs. Cox & Co. for annual payments. I think the money could be raised in this way without difficulty.

Sheffield, J. L. Smith,

27th June, 1896. Captain, R.A.

7.
Captain Askwith.

Try circulars—riders one race only.

Colchester, J. B. F. Askwith,

29th June, 1896. Captain, R.A.

Captain Mackenzie's remarks.

I forward the above correspondence, hoping that officers interested may be induced to forward their views on these or any other points to me or one of the stewards.

Orders on Messrs. Cox & Co., payable on 1st November each year, will be sent round, and it is hoped that all officers fond of hunting will send a subscription, however small, and so ensure the financial success of the meeting.

There appears to be an almost unanimous opinion among the stewards that no one should be allowed to ride in more than one race. I think this is a point on which they would like the opinion of the Regiment at large.

There is no doubt, I think, that this proposal, if carried, will seriously affect the number of the entries. Some men may not care to go any distance for one ride, especially with the chance there is in a point-to-point, of that one ride being a short one.

On the other hand it prevents one man having an undue advantage through knowing the course, and it would enable Captain Paget's suggestion of a straight course being carried out, which is almost an impossibility if competitors are riding in more than one event. Perhaps those who are interested in this matter would write their views either to me or to one of the stewards so that the point may be settled.

Any suggestions as to locality for next year, or any point which may strike any one, will be gladly received. Otherwise the conditions will remain the same as this year.

POLO.

The following short account of some matches played by R.A. teams at Hurlingham during the present season may interest polo players and others.

In the first our back failed us, and we had to import a civilian, but it was practically an Artillery team, and defeated a very strong Hurlingham one.

25th May.—

	R.A.	*v.*	Hurlingham.
1.	Mr. C. Head.		1. Mr. Churchill, 4th Hussars.
2.	Capt. Schofield.		2. Mr. Gerald Hardy.
3.	,, Mackenzie.		3. Capt. Le Gallais, 8th Hussars.
Back.	Mr. T. Drybrough.		Back. Mr. John Watson.

The R.A. held their opponents from start to finish and finally won by 6 goals to 3.

Saturday, 30th May.—

	R.A.	*v.*	Hurlingham.
1.	Mr. C. Head.		1. Capt. Lafone, 4th Hussars.
2.	Capt. Schofield.		2. Mr. Jenner, 60th Rifles.
3.	,, Mackenzie.		3. Capt. Fitzgerald, R.H. Gds.
Back.	,, Ferrar.		Back. Mr. T. Drybrough.

R.A. won easily 5 goals to 2.

4th June.—

	R.A.	*v.*	Ranelagh.
1.	Capt. Ferrar.		1. Mr. Jameson.
2.	,, Schofield.		2. Lord Harrington.
3.	,, Mackenzie.		3. Mr. Jones.
Back.	,, Hanwell.		Back. Mr. John Watson.

The R.A. in this game were not playing so well together as before, and Captain Hanwell was not mounted well enough to do himself justice. We were beaten 3 goals to 1.

9th June.—

	R.A.	*v.*	Hurlingham.
1.	Capt. Ferrar.		1. Mr. Lloyd.
2.	,, Schofield.		2. Mr. Court.
3.	,, Mackenzie.		3. Mr. G. Miller.
4.	,, Hanwell.		4. Sir H. de Trafford.

R.A. won by 4 goals to 0.

13th June.—

	R.A.	*v.*	4th Hussars.
1.	Capt. Ferrar.		1. Capt. Lafone.
2.	,, Schofield.		2. Major Peters.
3.	,, Mackenzie.		3. Capt. Hoare.
4.	Mr. Aldridge.		4. Major Kincaid-Smith.

We won easily by 3 goals to 1. Mr. Aldridge played brilliantly.

20th June.—

	R.A.	*v.*	R.H. Guards.
1.	Capt. Ferrar.		1. Mr. E. Rose.
2.	,, Schofield.		2. Capt. Fenwick.
3.	,, Mackenzie.		3. Mr. R. Ward.
4.	,, Hanwell.		4. Capt. Fitzgerald.

In this game too we did not play as well together as usual, but eventually won by 5 goals to 2.

22nd June.—

R.A.	*v.*	4th Hussars.
1. Capt. Ferrar.		1. Mr. Churchill.
2. ,, Schofield.		2. Major Peters.
3. ,, Mackenzie.		3. Capt. Hoare.
4. Mr. Aldridge.		4. Mr. Barnes.

The 4th had strengthened their team since last we met them. Capt. Hoare was playing particularly well, and they beat us pretty easily by 5 goals to 2.

LYDD.

The annual Siege Artillery camp at Lydd was opened under the command of Lieut.-Colonel Rainsford-Hannay on the 1st May.

The following were the staff:—

Staff Officer	Captain R. P. Benson.
Gunnery Instructor	Major W. H. M. Shewell.
Recording Officers	Lieutenant J. F. Westerman.
... ...	,, R. O. Marton.

The two late recording officers, Lieutenants Owen and Manley have gone respectively to the Artillery College and India.

We have been favoured with lovely weather and all have much enjoyed the camp.

The 1st division R.A. consisted of Nos. 15 (S.T.) and 20 Coys. S.D. under the command of Lieut.-Colonel Barrington-Foote with Captain Fasson as his Adjutant. They stayed from 1st May to 5th June, during which time a series of weekly concerts were held in the Camp Theatre under the able management of Lieut.-Colonel Barrington-Foote and proved of a very high class order. The proceeds were forwarded to the Church of England Soldiers' Institute at Woolwich.

The men are very comfortably housed in the barracks. The officers are under canvas, as the officers' quarters, though completed, have not yet been handed over for occupation.

The Long Course arrived here on the departure of the 1st division and stayed from 6th to 19th June. This is the first time that they have been here by themselves and consequently, the mess being uncrowded, they and all of us were much more comfortable than usual.

The 2nd division R.A. consisting of No. 7 (S.T.) Coy. E.D. and 15 (S.T.) W.D. under the command of Lieut.-Colonel J. C. Dalton with Captain M. L. Carleton as his Adjutant, arrived on the 19th June and will stay, 7 Eastern, till the 25th July, and 15 Western until the end of the season.

The weekly concerts have been kept up and are well patronised. For the concert on the 3rd July, we had the valuable help of Major F. B. R. Toms, R.A., who stayed with us for a week and whose versatile powers as a comic singer are well known. The proceeds of the 2nd division concerts will be devoted to the R.A. Charities.

During the hours of recreation, cricket, golf, lawn tennis and sticke, riding, bathing and biking are much in vogue, the roads being admirably adapted for the last named. We have not unfortunately been able to get up a great many cricket matches, but we have, so far, been successful in all we have undertaken. We played and beat the East Surrey Regiment by 120 to 61, New Romney 200 for 9 wickets to 56, and Tenterden, (whom we have never beaten before) by 166 to 44. We have a very fair cricket team here at present.

For those of a social turn of mind there are numerous lawn tennis parties given by the neighbouring gentry, whilst the golf links at Littlestone are hard to beat, and the club lets officers in as temporary members on the exceedingly

moderate terms of 10s. 6d. for six months.

Major H. W. M. Shewell vacated the post of Gunnery Instructor on the 1st June and left Lydd, to the regret of all, after having been here, off and on, since 1889. He has now gone to Gibraltar, where we wish him all good luck. On leaving he kindly presented the mess with a handsome clock and barometer for the ante-room. Major Shewell's place here is now ably filled by Captain S. C. U. Smith. Other useful presents have been made to the mess, including handsome brass inkstands by Lieut. Owen.

We had an opportunity of testing the camp fire engine on June 17th, when some barns and stacks close to the railway station were set on fire. We got the alarm about 11.15 p.m. and the engine and all the troops in camp, at the time, were at the scene of the fire, with our new engine, in a very short time. The engine looked very nice, and the men worked very well, but the hose was some 400 feet too short to be of any real value. There was another alarm a week or so later, during mess dinner hour, but (though the engine started out), we fortunately did not get to the fire, which, on enquiry next morning, was found to have been caused by a man burning some rubbish heaps!

The minds of those in authority over us are specially turned this year to the fighting of a section command and no doubt, before the end of the season, great advances will have been made in that direction.

The night operations took place between 9 and 11 p.m., four nights for each division, and passed off well, with fine weather to favour them.

The R.A. have given some pleasant lawn tennis parties, or "gaffs" as they are vulgarly named, and the two tennis courts are now in very fair order.

On July 8th there was a fancy fair and fête held in the grounds of The Grange, the residence of Mrs. Denne. Amongst other entertainments there was a very successful bicycle gymkhana which included such feats as the "egg and spoon" and "bill posting" races; also a race where the competitors, after riding two laps, had to dismount, drink a bottle of soda water out of the bottle, light a cigarette, remount and finish with the cigarette still alight. Lieutenants Craig, Moorhouse and Goldie were the three successful competitors. The proceeds of the fête are for a stained glass east window for Lydd Church, which is probably the finest of the many fine churches in this district.

On the 10th July a carbine competition for a prize given by Lieut.-Colonel J. C. Dalton took place between the two S.T. Coys. of the 2nd division. The teams were composed of N.-C.O.s and men—11 a side—five shots at 200 and five at 400 yards. 7 Eastern was successful by 300 as against 254 made by 15 Western.

The health of the men has been very satisfactory, and all seem to enjoy the pleasant change to this salubrious place.

The 37th Field Battery (5″ howitzers) from Hilsea marched in here on the 18th July, under command of Major Elmslie, and has been encamped here; it will probably stay for practice till the 10th August. The three batteries from Shorncliffe will then come from 10th August to 21st August.

There are many worse places than Lydd.

20th July, 1896.

OBITUARY.

Major L. Barrett, who died at Malta on 17th June, was first commissioned as Lieutenant, on 2nd February, 1876; became Captain, 19th November, 1884, and Major, 4th March, 1893. Major Barrett served in the Egyptian Expedition, 1882. (Medal and bronze star.)

Lieutenant C. A. Earle, whose death occurred at Saugor, on 15th July, joined the Regiment as Second Lieutenant, 17th February, 1888, and became Lieutenant 17th February, 1891.

CRICKET 1896.

ALDERSHOT DIVISION *v.* ROYAL ARTILLERY.

PLAYED AT ALDERSHOT, 22ND AND 23RD MAY.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. Adair, c Murphy, b Stack	0		
Capt. Dorehill, c Vizard, b Stack	17	not out	61
Capt. Wynne, b Stack	6	c Liddell, b Murphy	0
C. C. Barnes, b Murphy	0	c Murphy, b O'Donnell	25
Major Curteis, c Paget, b Stack	18	b O'Donnell	65
Capt. E. S. Cooper, b Stack	4		
W. O. Holloway, b Stack	33	not out	22
Capt. Quinton, c Budworth, b Stack	10	b Budworth	10
H. C. Moorhouse, not out	62	c Liddell, b Stack	38
E. G. Waymouth, c Rice, b Murphy	8		
K. St. G. Kirke, b O'Donnell	4	st Vizard, b Murphy	4
Extras	1	Extras	1
Total	163	*Total (6 wickets)	226

*Innings declared closed.

ALDERSHOT DIVISION.

1st Innings.		*2nd Innings.*	
Capt. Taylor, c Moorhouse, b Holloway	27	c Quinton, b Moorhouse	20
Capt. Rice, c Quinton, b Holloway	20	c Quinton, b Moorhouse	21
Lieut. Manners Smith, b Holloway	1	c Adair, b Moorhouse	22
Capt. Liddell, c Wynne, b Holloway	4	lbw., b Dorehill	12
C. E. D. Budworth, c Wynne, b Kirke	22	run out	21
Lieut. Paget, c Quinton, b Moorhouse	34	b Moorhouse	2
Capt. Vizard, b Moorhouse	15	c Curteis, b Dorehill	0
Lieut. Rutter, not out	33	st Cooper, b Holloway	8
Lieut. Stack, b Moorhouse	2	c Quinton, b Adair	36
Pte. Murphy, not out	0	not out	0
Capt. O'Donnell, c Barnes, b Holloway	1	b Adair	22
Extras	6	Extras	4
Total	165	Total	168

ROYAL ARTILLERY *v.* ETON RAMBLERS.

PLAYED AT WOOLWICH, 29TH AND 30TH MAY.

ETON RAMBLERS.

1st Innings.		*2nd Innings.*	
G. S. Foljambe, b Holloway	6		
H. F. Foljambe, c Butler, b Holloway	91	c Wheeler, b Fegen	19
R. C. Gosling, c Curteis, b Holloway	15	b Fegen	21
H. B. Chinnery, c Wheeler, b Crampton	30	not out	37
A. M. Miller, b Holloway	32		
W. R. Hoare, not out	36	b Holloway	9
Capt. Soltan Symons, b Holloway	2		
G. A. Foljambe, c Adair, b Gosling	20	b Stanton	0
C. E. Farmer, b Holloway	12		
J. B. Pelham, c Crampton, b Holloway	1	not out	4
A. E. B. Ind, lbw., b Holloway	6	b Fegen	0
Extras	8	Extras	10
Total	259	Total (5 wickets)	100

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
E. L. Wheeler, b G. A. Foljambe	5	b Miller	0
F. H. G. Stanton, st Farmer, b G. A. Foljambe	1	b Pelham	18
Major Fegen, run out	8	c Farmer, b Miller	30
W. G. Holloway, lbw., b G. A. Foljambe	12	b Miller	41
Major Curteis, not out	41	b Chinnery	95
Capt. Wynne, b G. A. Foljambe	0	c H. F. Foljambe, b Pelham	33
S. F. Gosling, b G. A. Foljambe	3	c Gosling, b Miller	68
Capt. Adair, c Pelham, b G. A. Foljambe	3	not out	45
Bombr. Butler, b Pelham	1	c and b Pelham	4
Capt. Crampton, b Miller	16	c Chinnery, b Pelham	8
E. G. Waymouth, b Miller	0	not out	12
Extras	3	Extras	27
Total	93	Total	381

GENTLEMEN OF M.C.C. *v.* ROYAL ARTILLERY.

PLAYED AT LORDS, 1ST AND 2ND JUNE.

M.C.C.

1st Innings.		*2nd Innings.*	
A. E. Stoddart, b Moorhouse	84		
T. Herbert, c Fegen, b Moorhouse	4	not out	15
F. W. Maude, c Cooper, b Holloway	2		
Sir T. C. O'Brien, b Holloway	93		
A. J. Webbe, b Moorhouse	1		
J. A. Gibbs, c Wynne, b Moorhouse	70		
E. C. Mordaunt, c Cooper, b Holloway	83		
G. Denison, b Moorhouse	4		
A. M. Miller, not out	8	not out	21
A. E. Leatham, lbw., b Moorhouse	0		
F. Walkinshaw, b Holloway	22		
Extras	9	Extras	0
Total	380	Total (no wickets)	36

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Major Fegen, b Stoddart	22	st Walkinshaw, b Stoddart	13
C. C. Barnes, b Mordaunt	4	b Denison	43
W. O. Holloway, b Mordaunt	0	b Stoddart	40
Major Curteis, c and b Maude	0	c Webbe, b Stoddart	11
Capt. Dorehill, b Stoddart	26	b Denison	18
Capt. Wynne, c Leatham, b Maude	11	b Miller	18
Capt. Adair, c Maude, b Stoddart	4	b Miller	1
H. C. Moorhouse, c Webbe, b Maude	28	b Miller	22
Capt. E. S. Cooper, not out	6	ht wkt, b Denison	0
F. H. G. Stanton, b Stoddart	6	not out	52
E. G. Waymouth, b Maude	0	st Walkinshaw, b Maude	55
Extras	18	Extras	17
Total	125	Total	290

NOTES
FROM
CORRESPONDING MEMBERS.

LEFROY GOLD MEDAL.

After the conclusion of the business of the R.A.I. Charities and Games' Fund on the 12th July 1896, Lieut.-General E. Markham, I.G.O., said—"Gentlemen, I have to-day the pleasure of handing to the winner the Lefroy Gold Medal for the current year. Perhaps some of you may have forgotten that this medal is given to the officer passing the best examination on leaving the Senior Class of the Artillery College. Captain Maurice Lloyd has on this occasion, I believe, made almost a record, having obtained honours in every subject. Not only has he done credit to himself, but we are all pleased that the Deputy-Adjutant-General Royal Artillery should have such a son. Captain Lloyd I have much pleasure in handing you this medal.

Captain Lloyd briefly expressed his thanks and the proceedings terminated.

The "Advance Class" dinner took place on Wednesday evening, 17th June, at the Hotel Cecil. Amongst those present were:—Major-General Tweedie, R.A., Major-General Wardell, R.A., Colonel Bainbridge, R.A., Lieut.-Colonel Dawson, R.A., Lieut.-Colonel Hemans, R.A., Major Hadden, R.A., Major Leach, R.A., Major Ward, R.A., Major Pease, R.M.A., Captain Adair, R.A., Captain Campbell, R.A., Captain Cooper-Key, R.A., Captain Farmar, R.A., Captain Fisher, R.A., Captain Lloyd, R.A., Captain Martel, R.A., Captain Minchin, R.A., Captain Nathan, R.A., Captain Ormiston, R.A., Captain Randolph, R.A., Captain Rolt, R.A., Captain Tisdall, R.A., Captain Wallace, Suffolk Regiment, Lieut. Bellairs, R.A., Lieut. Carlyon, North Staffordshire Regiment, Lieut. Davies, R.A., Lieut. Owen, R.A., Lieut. Phipps, R.A.

REGIMENTAL DINNER, 1896.

This was the first occasion upon which H.R.H. the Duke of Cambridge presided as Colonel of the Regiment at the Regimental Dinner since his resignation of the appointment of Commander-in-Chief: it was therefore most gratifying to be able to state that, with the exception of the year 1893, when the Regiment welcomed Lord Roberts home from India and invited H.R.H. the Duke of Connaught to meet him, this is a record year as regards numbers dining, no less than 179 officers having been present.

As regards the dinner club; since the promulgation of the new rules, reducing the entrance fees, there has been an accession of 40 members: or to put the matter plainly in relation to other years, 40 members have joined the dinner club in three months, as against 27 members in the preceding four years.

These facts show conclusively that the large majority who voted in favour of the new rules, as regards membership and price of dinner, have effectually backed their opinion, while the minority who dissented on the subject of the turtle soup have accepted the adverse vote in a friendly spirit.

Many complaints have been made on the subject of the band, a pretty general feeling seems to prevail that a combination of dinner and band is not a satisfactory arrangement, as you must either shout down the band if you want to talk to your friends, or else sit silent in order to listen to the music and thereby sacrifice the principal object of the dinner, viz., social intercourse with your brother officers. An experiment was therefore made this year which it is hoped gave satisfaction, viz., the band did not play during dinner, but between the toasts and until the programme was concluded.

R.A. GAMES' FUND.

THE accounts presented herewith are those for 1895 and 1896 down to 3rd June. They show receipts of subscriptions for two years and the expenditure on the Inter-regimental matches for a similar period.

Although not shown separately on the account sheet the meeting may like to hear that the credit of the Fund on 31st December 1895 was about £30 greater than on the same date 1894 after deducting £500 for investment from each. As the accounts stand to-day the Fund is about £20 more in credit than this time a year ago.

A glance shows how largely the expenses of the year in which the racket and billiard matches are played at Woolwich exceed those of the year of play at Chatham.

In 1896 there was a large increase in the number of aspirants to the honour of playing golf for the Regiment with the result that the expenses connected therewith have risen from £12 to £44. The Committee regret that the Regiment has again failed to win the golf match with the Royal Engineers but are glad to report that some promising players are coming on among the junior officers.

The matches at Chatham this year resulted in the Regiment losing the billiard cup and retaining the racket cup. The billiard matches were all most closely contested. Thanks to the excellent play of Captain Cooper-Key and 2nd Lieutenant W. L. Foster the victories in the four-handed and second single racket match were fairly easy, while the first single which Captain Cooper-Key won from Captain Hamilton was a splendid struggle.

The sum of £500 has been invested as directed at the General Meeting last year, except that owing to difficulties of Post Office regulations £200 has been invested in the name of the Hon. Secretary in local loans stock so that he can sell out if any of it is suddenly required. It is not intended to make further investments.

There were six grants made to various stations in 1895 and the accounts show that two grants have been repaid to the Fund in accordance with the conditions under which they were made.

The number of subscribers to the Fund, May 1895 = 639
" " " " " " " June 1896 = 922

The increase in number is partly due to the action of the Committe who sent a letter last autumn to every officer commanding a Battery or Company in the Regiment, drawing the attention of officers to the Fund and pointing out the fact that many think they have subscribed to it for years when such is not the case.

The Committee hope before long to issue with the R.A.I. "Proceedings" a list of subscribers to, a list of grants from and a general description of the objects of the Fund.

The Committee regret losing the services of Colonel G. J. Burgmann, who has recently retired; his assistance, especially in the matter of the golf matches, has been most valuable.

Colonel J. Bally has kindly consented to fill the vacancy on the Committee caused by Colonel Burgmann's retirement.

The Committee now consists of :—

Major-General J. Alleyne, C.B., President,
Colonel J. Bally,
Lieut.-Colonel P. L. Macgregor,
Major W. F. Lindsay
and
Major A. J. Abdy, Hon. Secretary.

EXPENDITURE.

	£	s.	d.	£	s.	d.
Grants—R.A. Gibraltar (Europa), Sticke	25	0	0			
〃 —R.A. Dover, Sticke	10	0	0			
〃 —R.A. Shoeburyness, Boats ...	30	0	0			
〃 —R.A. Seaforth, Liverpool, Sticke	25	0	0			
〃 —R.A. Cricket Club, Relaying turf	40	0	0			
〃 —R.A. Bombay, Racing Yacht ...	30	0	0			
〃 —R.A. Dover, Officers' Cricket pitch	30	0	0			
〃 —R.A. Pembroke Dock, Sticke	20	0	0			
〃 —R.A. Drag-Hunt, Kennels ...	5	0	0			
〃 —R.A. Dover, Clay Pigeon traps	3	0	0			
〃 —R.A. Golden Hill, Sticke ...	25	0	0			
				243	0	0
India Polo Tournament Challenge Cup				5	0	0
New plinth to R.A. R.E. Racket Cup				5	6	0
Expenses Racket and Billiard Matches, 1895, Officers	5	10	0			
〃 〃 〃 〃 〃	2	12	0			
〃 〃 〃 〃 〃	3	0	0			
〃 〃 〃 〃 〃	7	18	10			
				19	0	10
1896 〃 〃 〃 〃	3	10	0			
〃 〃 〃 〃 〃	5	2	0			
〃 〃 〃 〃 〃	3	1	6			
〃 〃 〃 〃 〃	3	11	3			
				15	4	9
Expenses Racket and Billiard Matches, 1895	10	0	0			
〃 〃 〃 〃 〃	8	1	10			
〃 〃 〃 〃 〃	11	8	0			
〃 〃 〃 〃 〃	1	0	0			
〃 〃 〃 〃 〃		7	6			
〃 〃 〃 〃 〃		5	0			
〃 〃 〃 〃 〃	1	5	0			
				32	7	4
1896 〃 〃 〃 〃	2	7	6			
〃 〃 〃 〃 〃	1	4	2½			
〃 〃 〃 〃 〃	1	0	0			
〃 〃 〃 〃 〃	1	0	0			
〃 〃 〃 〃 〃	1	0	0			
〃 〃 〃 〃 〃		10	0			
				7	1	8½
Expenses Golf Trials & Matches, 1895...	3	0	0			
〃 〃 〃 〃 〃 〃	2	18	0			
〃 〃 〃 〃 〃 〃	2	18	4			
〃 〃 〃 〃 〃 〃	1	12	9			
〃 〃 〃 〃 〃 〃	1	1	8			
〃 〃 〃 〃 〃 〃	1	0	0			
				12	10	9
〃 〃 〃 〃 〃 1896...	1	6	0			
〃 〃 〃 〃 〃 〃	1	18	9			
〃 〃 〃 〃 〃 〃	2	10	11			
〃 〃 〃 〃 〃 〃	1	9	2			
〃 〃 〃 〃 〃 〃	1	6	0			
〃 〃 〃 〃 〃 〃	4	14	0			
〃 〃 〃 〃 〃 〃	5	1	0			
〃 〃 〃 〃 〃 〃	4	0	0			
〃 〃 〃 〃 〃 〃	5	13	2			
〃 〃 〃 〃 〃 〃	5	3	6			
〃 〃 〃 〃 〃 〃	3	6	0			
〃 〃 〃 〃 〃 〃	5	0	0			
〃 〃 〃 〃 〃 〃	1	10	0			
〃 〃 〃 〃 〃 〃		15	0			
〃 〃 〃 〃 〃 〃	1	8	0			
				44	15	6
Subscriptions recredited				7	4	0
Clerk making out Annual List, 1895 ...	1	0	0			
〃 〃 〃 〃 〃 1896 ...	1	0	0			
〃 donation for extra work, 1895 ...	1	0	0			
				3	0	0
Set of trial billiard balls, Cox & Yeman				3	15	5
Printing and cheque book					7	9
Postage, 1895	3	12	10			
〃 1896	2	7	1			
				5	19	11
Purchase of £283 16 3 2½ p.c. Consols				300	0	0
〃 〃 £174 16 5 3 p.c. Local Loans Stock...				200	0	0
Balance at Messrs. Cox & Co.	187	4	8			
Balance Cash in Secretary's hands ...		13	7½			
				187	18	3½
Total				1092	12	3

RECEIPTS.

	£	s.	d.	£	s.	d.
Credit brought forward from 1894				579	11	9
Cox & Co. credited by, 1895	178	11	0			
〃 〃 〃 〃	1	3	0			
〃 〃 〃 〃	1	10	0			
〃 〃 〃 〃	3	2	0			
〃 〃 〃 〃		16	0			
〃 〃 〃 〃	4	1	0			
〃 〃 〃 〃	4	6	0			
〃 〃 〃 〃	17	15	0			
〃 〃 〃 〃	12	1	0			
				223	5	0
〃 〃 1896 〃	5	0	0			
〃 〃 〃 〃	223	0	0			
〃 〃 〃 〃	2	1	0			
〃 〃 〃 〃	2	15	0			
〃 〃 〃 〃		3	0			
〃 〃 〃 〃	2	6	0			
〃 〃 〃 〃		3	0			
				235	8	0
Dividends, 1896, Jan.	1	14	3			
〃 〃 Apr.	1	14	3			
				3	8	6
Subscriptions recd. direct, 1895 ...	5	14	0			
〃 1896 ...	5	5	0			
				5	19	0
R.A. Hong Kong refund grant for yacht, 1895 ...	20	0	0			
R.A. Europa Gibraltar, refund grant for sticke, 1896	25	0	0			
				45	0	0
Total				1092	12	3

Woolwich,
3rd June, 1896.

A. J. ABDY,
Hon. Secretary R.A. Games' Fund.

OBITUARY.

Captain T. Gibson (retired) died at Plumstead on 20th May, 1896. He was commissioned as Quarter-Master, 10th July, 1867, and became hon. Captain, 15th August, 1877, on retiring on half-pay.

Lieutenant (D.O.) T. Gilbertson, who died at Alderney on 13th June, 1896, was commissioned from the ranks as Lieutenant on 20th February, 1892. He served during the Egyptian Expedition 1882 and was present at the action at Mahuta, capture of Mahsameh and first action at Kassassin. (Medal and bronze star).

Lieut.-Colonel C. S. Graham (retired), whose death occurred suddenly at Clifton on 20th June, 1890, joined the Regiment as Lieutenant, 10th October, 1863; became Captain, 14th May, 1876; Major, 21st June, 1883, and retired with the hon. rank of Lieut.-Colonel, 19th November, 1884.

Colonel H. Latham (retired) who died at Tonbridge on 17th June, 1896, first joined the Bengal Artillery as 2nd Lieutenant, 12th June, 1858; became Lieut., 27th August, 1858; Captain, 30th September, 1869; Major, 31st December, 1878; Lieut.-Colonel, 26th May, 1885; Colonel, 26th May, 1889, and retired on Indian pension and extra annuity, 12th June, 1890. Colonel Latham served during the Indian Mutiny 1858, and was present at the taking of Simree and action of Berar. (Medal).

NOTES

FROM

CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1897.

THE Subject approved by H.R.H. The Colonel-in-Chief for the "Duncan" Gold Medal Prize Essay, 1897, is as follows :—

"Coast Artillery Practice; how best to conduct it with a view to the requirements of actual warfare."

The Rules for the Prize Essays now read :—

The Annual Gold Medal, when awarded, to be accompanied by an *honorarium* of £20; the Silver Medal by an *honorarium* of £10.

The candidates must be Officers of the Regiment who are members of the R.A. Institution.

Officers are requested to confine their Essays to about 16 printed pages of the "Proceedings;" other things being equal brevity will count towards success.

The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each Essay must be *type-written* in triplicate. The Essays must be strictly annoymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the competition has been announced, and he will send the writers the money for their type-writing expenses.

The Committe will allow a sum of £1 for type-writing each Essay.

The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend :—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
3. That no Medal be awarded.

The names of the successful candidates will be announced at the Annual Meeting, and Medallists will be distinguished as such in all Lists, &c., issued from the

Institution; and in the event of a University man gaining a Medal, a report of his success will be made to the University of which he may be a member.

The successful Essays will be printed and circulated to members by the Institution.

N.B.—The Committee draw particular attention to the paragraph in the Rules above on the subject of length of Essays; it is not difficult to discover the number of words in an average page of "Proceedings" matter, and so to keep an Essay within the 16 pages' limit.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

"The Shrapnel Fire of the Field Artillery" by Major-General Rohne. Translated by Colonel N. L. Walford, price 2s. 6d.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d.

The two Numbers of "Nature" containing Professor C. V. Boys's Lecture on "Photography of Flying Bullets," fully illustrated, price 8d.

Examination questions in (*c*), (*d*), and (*e*) set in the five examinations ending November 1895:—

Captains (*c*) and (*d*) ... ... price 1s. 1d.
Lieutenants (*c*), (*d*) and (*e*) ... price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

THE R.A. Institution have copies of the undermentioned works bound in cloth, which can be bought by members at the price of 1s. each:—

Colonel Walford's Translation of Prince Kraft's Letters on Cavalry. 18 copies.

Colonel Walford's Translation of Prince Kraft's Letters on Infantry. 35 copies.

These are the copies as published in Translations with the "Proceedings" and should be useful to members who have joined since the date of their publication, price, 1s. each.

WOOLWICH.

The week commencing July 20th witnessed the second celebration of the R.A. Polo Tournament which was inaugurated in 1895 by Mr. Gillson, R.H.A., who is now in India and which proved so successful that it was repeated this year and, judging by the interest shown, ought now to become an annual affair.

Eight teams were invited to enter and all accepted, but owing to the exigencies of the service the R.A., Aldershot, were compelled to scratch at the last moment, though why they should have been more unfortunate than the two cavalry regiments, who did put in an appearance from that place, was not apparent.

The first match was between the Greys and IX. Lancers, represented as follows:—

	Greys.	*v.*	IX.
1.	Mr. Harrison.		Mr. Campbell.
2.	Capt. Maxwell.		Lord D. Compton.
3.	Major Middleton.		Mr. Allhusen.
Back	Capt. Bulkeley-Johnson.		Capt. Henry.

The Greys scored the 1st goal but were defeated by the superior combination of the IX., who won by 5 goals to 2.

The next match was between *Fetcham Park* and a *Hounslow* team composed of three players of the 4th Hussars and Mr. J. Dryborough of Hurlingham. This was a fast and pretty game, Hounslow winning by 6 goals to 2, a result to which Mr. Dryborough's powerful hitting contributed in no small degree.

The sides were as follows:—

	Hounslow.	*v.*	Fetcham.
1.	Mr. Churchill.		Mr. Drake.
2.	,, Savory.		,, E. Sheppard.
3.	,, Dryborough.		,, G. Sheppard.
Back	,, Barnes		,, Cobham.

The R.A., Woolwich, now had a bye, their opponents, R.A., Aldershot, scratching and the next game was a most interesting one between the 1st Life Guards and "The Blues," composed thus:—

	1st Life.	*v.*	Royal Horse Guards.
1.	Mr. Cookson.		Mr. Rose.
2.	Capt. Milner.		Capt. Fenwick.
3.	Lord Lovat.		Mr. Ward.
Back	Mr. Schreiber.		Capt. Fitzgerald.

The "Blues" led off the best, securing three goals, then their opponents playing up made two, and nothing more being scored, the "Blues" were returned the winners. This completed the first round.

The second was begun by the IX. Lancers playing Hounslow and the latter proved too powerful, winning by 5 goals to 0, the IX. being encouraged by the presence on the ground of two of their regimental cup team, Lord C. Bentinck and Mr. Ellison, who had travelled from Aldershot to give their men the benefit of their moral support. Every one was sorry to see the IX. beaten, because they had most sportingly refrained from sending their best team, but their representatives made a gallant fight and did credit to their regimental polo training.

The next game excited a lot of interest, played as it was between the R.A., Woolwich, represented as follows:

1.	Mr. C. O. Head.
2.	Capt. Ferrar.
3.	Major Porteous.
Back	Mr. J. B. Aldridge,

and the "Blues."

The R.A. had a bit the best of it and won a most exciting gave by 4 goals to 3. Capt. Ferrar and Major Porteous playing in capital form for their side.

The final now lay between the R.A., Woolwich, and Hounslow and was witnessed by about the largest crowd ever seen on the R.A. Polo Ground and resulted in a capital game. The R.A., who were somewhat handicapped by their ponies having had a severe tussle with the "Blues" on the previous day, went away at once and by capital polo, had at half-time secured 3 goals to 0. Their ponies now began to show signs of having had enough and Hounslow put on two goals, then Woolwich came again and secured another, but this was their last and they now had to do all they could to defend their own goal, but in spite of all Hounslow's efforts they could only put on one more, leaving the result 4 goals to 3 in favour of Woolwich. All the winning team played well and it was a decidedly creditable performance to beat so powerful a combination as their opponents were and one that we hope will be encouraging to all players in the R.A. who indulge in this fascinating game. Success in this game depends on the possession and the thorough knowledge of 3 or at least 2 real good ponies and unswerving loyalty and confidence among the players themselves. We have too often tried to play with men on strange ponies and strangers to each other and the result has never been good. It only remains to add that the thanks of all the people of Woolwich who took part in the tournament, both as players, and spectators, are due to Col. Lockhart, R.A., for his kindly support and sympathy, without which the tournament could not have taken place at all. A word of praise and thanks might also be given to Mr. Pim, R.A., for the immense amount of care and trouble he bestowed on the ground, which was in capital order, and to Capt. Paget, R.H.A., and Mr. Wark, R.A., for their correct and able umpiring. Most of the details of the tournament were arranged by Mr. Head, R.A., who did all he could to ensure its success.

MURREE.

EIGHTEEN members of the Regiment in this place of pleasure (limited) gathered together in the club of Northern India at the dinner table on June 29th, and the gathering was so successful that we wish to place it on record. Fortunately nearly all were more or less known to one another, which fact conduced considerably to the success of the evening, several not so long ago were soldiering together at Woolwich. General Tyler who commands the R.A. in the Punjab presided, and we entertained General Moorsom as the guest of the evening. General Moorsom commands the Rawal Pindi district and has lately been officiating for Sir William Lockhart up here, so we were all glad to offer him the small honour of being our guest. As at 2.30 a.m. on the 30th June he was pleased to express his pleasure of having dined with us, we really hope he did enjoy himself. Midnight was passed with a very convivial sing song in full swing, which was much assisted by friends of the Regiment. Lieut. Carpenter of the Sappers supplied music at the piano by the hour, and that well-known Scots Fusilier, Lieut. Hayes-Sadler, contributed many items in the form of recitations and native music. After a welcome supper the last of the party separated for the rest of the night at about 3 a.m.

The following were present at the board in the order named :—

Major-General Moorsom ; Brig.-General T. B. Tyler ; Captain F. Vans-Agnew ; Lieut. B. J. M. Locke ; Lieut. G. Gillson ; Captain F. A. G. Elton, *President* ; Lieut. F. L. Galloway ; Lieut. R. St. C. Harman ; 2nd Lieut. C. St. M. Ingham ; Lieut. G. F. Dixon ; Captain J. E. Harvey ; Lieut. G. R. M. Church ; Lieut. W. St. C. Bland ; Lieut. A. le M. Bray ; Lieut. C. de Sausmarez ; Captain A. L. Walker, *Vice-President* ; Lieut. W. L. J. Carey ; Captain E. E. Norris ; Lieut.-Col. C. H. Scott.

OBITUARY.

Colonel A. Tylee (retired), who died in London on 2nd July, 1896, was first commissioned as 2nd Lieutenant, 18th December, 1829; became Lieutenant, 1st April, 1831; 2nd Captain, 23rd November, 1841; Captain, 14th October, 1846; Lieut.-Colonel, 20th June, 1854; and retired on full pay with the hon. rank of Colonel, 8th March, 1855.

CRICKET 1896.

ROYAL ARTILLERY *v.* QUIDNUNCS.

PLAYED AT WOOLWICH, 10TH AND 11TH

ROYAL ARTILLERY.

	1st Innings.		*2nd Innings.*	
C. C. Barnes, b Shand	63	st Dent, b Ramsay	6
A. Hinde, b Shand	1		
E. L. Wheeler, b Rudd	21		
Major Curteis, c Maynard, b Leatham	38		
S. F. Gosling, b Shand	0		
Capt. Adair, not out	28	not out	0
Capt. White-Thomson, b Leatham	5	c Leatham, b Gore	10
C. A. Sykes, st Greatorex, b Leatham	17	c Leaf, b Ramsay	3
E. G. Waymouth, c Gore, b Leatham	2		
Major Coker, c and b Gore	0	c and b Gore	0
K. St. G. Kirke, b Leatham	4	b Ramsay	5
Extras	16	Extras	1
Total	195	Total (5 wickets)	25

QUIDNUNCS.

E. A. J. Maynard, c Gosling, b Hinde	19
G. P. Gore, b Hinde	38
P. F. Hadow, b Kirke	1
W. H. Dent, b Hinde	0
Hon. J. R. Brownlow, b Kirke	4
R. C. Ramsay, b Kirke	21
H. M. Leaf, b Kirke	5
A. E. Leatham, b Hinde	8
Rev. T. Greatorex, c Barnes, b Hinde	12
F. L. Shand, not out	16
C. J. Rudd, c White-Thompson, b Waymouth	9
Extras	14
Total	147

B.B. *v.* ROYAL ARTILLERY

PLAYED AT WOOLWICH, 12TH AND 13TH JUNE.

B.B.

1st Innings.		*2nd Innings.*	
Lord Harris, c White-Thomson, b Budworth	73	not out	27
L. Weigall, c Adair, b Dorehill	33	c Adair, b Dorehill	17
T. N. Tonge, not out	44	c Hinde, b Butler	20
S. Christopherson, b Hinde	6	lbw, b Dorehill	6
Hon. H. C. Milles, b Hinde	1	c and b Budworth	0
R. J. H. Arbuthnot, b Hinde	0	c Wynne, b Budworth	9
Captain Isacke, b Butler	1	c and b Budworth	6
Capt. D'Aeth, c Hinde, b Butler	0	c Curteis, b Hinde	0
R. Berens, b Hinde	0	b Hinde	0
G. Marshall, b Hinde	0	b Hinde	2
F. S. W. Cornwallis, b Hinde	0	b Dorehill	6
Extras	1	Extras	3
Total	150	Total	96

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
E. L. Wheeler, c Tonge, b Christopherson	9	b Milles	0
Capt. Wynne, c and b Christopherson	4	b Christopherson	16
Capt. Dorehill, c and b Christopherson	13	c Arbuthnot, b Christopherson	26
Major Curteis, c Arbutnot, b Christopherson	15	run out	29
Capt. Adair, c D'Aeth, b Christopherson	6	b Marshall	11
Capt. E. S. Cooper, b Christopherson	9	b Milles	51
C. E. D. Budworth, b Milles	2	b Marshall	0
Capt. White-Thompson, b Christopherson	6	b Christopherson	3
A. Hinde, b Milles	10	run out	10
C. A. Sykes, c and b Christopherson	11	not out	7
Bomb. Butler, not not	4	c Christopherson, b Marshall	0
Extras	5	Extras	8
Total	94	Total	161

ROYAL ENGINEERS *v.* ROYAL ARTILLERY.

PLAYED AT CHATHAM, 19TH AND 20TH JUNE.

ROYAL ENGINEERS.

S. D. Barrow, b Hinde	0
Capt. Hamilton, b Hinde	107
Capt. E. M. Blair, c Adair, b Kirke	21
F. G. Turner, c Hinde, b Kirke	95
M. O'C. Tandy, lbw., b Kirke	18
Lieut.-Colonel Renny-Tailyour, b Kirke	16
Capt. W. C. Hedley, b Dorehill	1
G. O. Bigge, lbw., b Kirke	40
W. S. Douglas, b Dorehill	8
Capt. Bigge, c Curteis, b Kirke	19
E. H. Rooke, not out	12
Extras	13
Total	350

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
C. C. Barnes, c Hedley, b Hamilton	0	b Hedley	53
W. L. Foster, b Hedley	28	run out	23
Major Curteis, b Hedley	1	c Tandy b Hamilton	3
Capt. Dorehill, c Tandy, b Hedley	26	c Blair, b Hedley	80
Capt. Quinton, c Renny-Tailyour, b Hedley	25	lbw., b Hamilton	52
W. O. Holloway, b Hedley	11	c Rooke, b Hamilton	0
Capt. Wynne, lbw., b Rooke	27	b Hedley	3
Capt. E. S. Cooper, b Hedley	9	lbw., b Hedley	5
Capt. Adair, c Tandy, b Hedley	3	not out	23
A. Hinde, b Hedley	4	b Hamilton	33
K. St. G. Kirke, not out	11	b Hedley	4
Extras	7	Extras	41
Total	152	Total	320

YORKSHIRE GENTLEMEN *v.* ROYAL ARTILLERY.

PLAYED AT WOOLWICH, ON 24TH AND 25TH JUNE.

ROYAL ARTILLERY.

C. C. Barnes, c Firth, b Lang	14
B. Atkinson, run out	3
F. H. G. Stanton, b Lang	5
Capt. King, c Landon, b Garforth	31
G. P. C. Blount, st Bruce, b Lane-Fox	81
R. S. Hamilton, st Bruce, b Lane-Fox	3
Major Curteis, b Firth	108
G. R. M. Mathew-Lannowe, c Lambton, b Firth	1
E. G. Waymouth, c Bruce, b Lang	10
K. St. G. Kirke, not out	14
E. W. Davies, b Lang	0
Extras	7
Total	277

YORKSHIRE GENTLEMEN.

	1st Innings.		*2nd Innings.*
Capt. G. G. Lang, b Waymonth	0	not out	115
Capt. C. D. Bruce, c Barnes, b Kirke	0	c Davies, b Blount	1
Rev. E. B. Firth, c and b Kirke	30	c Barnes, b Kirke	29
F. H. Walker, c Hamilton, b Blount	6	c and b Hamilton	19
C. P. Sykes, b Kirke	0	b Hamilton	23
C. W. Landon, b Kirke	10	c Blount, b Barnes	57
E. M. Lawson-Smith, b Blount	0	b Hamilton	11
W. H. Garforth, c Davies, b Blount	10		
E. T. Baines, c Curteis, b Blount	0		
Hon. C. Lambton, c King, b Kirke	2		
E. Lane-Fox, not out	0	c and b Kirke	6
Extras	0	Extras	21
Total	58	Total (7 wickets)	282

HOUSEHOLD BRIGADE *v.* ROYAL ARTILLERY.

PLAYED AT CHELSEA, 3RD AND 4TH JULY.

ROYAL ARTILLERY.

	1st Innings.		*2nd Innings.*
F. H. G. Stanton, b Studd	41	b Wentworth	14
Bomb. Osmond, c Pennington, b Bucknell	18	b Studd	7
Major Curteis, c Bailey, b Studd	6	c and b Wentworth	0
H. C. Moorhouse, b Wentworth	31	b Studd	47
Capt. H. R. Adair, b Studd	14	b Wentworth	12
Lieut.-Col Davidson, b Studd	0	c Bennington, b Studd	43
E. L. Tomkins, c Wilkinson, b Studd	16	b Pereira	71
L. M. Wilson, b Studd	4	c Bucknell, b Bailey	44
Capt. Slee, b Studd	27	b Studd	24
S. V. Schofield, b Bucknell	5	b Pereira	0
N. E. B. Bellairs, not out	0	not out	1
Extras	9	Extras	16
Total	171	Total	279

HOUSEHOLD BRIGADE.

Capt. B. V. Wentworth, c Tomkins, b Osmond	130
F. J. Heyworth, b Stanton	113
H. W. Studd, b Stanton	99
Sergt. Bucknell, c Schofield, b Moorhouse	20
Lord Newtown-Butler, b Stanton	1
N. R. Wilkinson, not out	29
J. H. R. Bailey, c Davidson, b Moorhouse	5
C. E. Pereira, b Stanton	16
Capt. Kindersley, c Tomkins, b Stanton	28
J. C. Heriot Maitland, b Stanton	36
Corpl. Pennington, not out	1
Extras	29
*Total (9 wickets)	507

*Innings declared closed.

ROYAL ARTILLERY *v.* HARLEQUINS.

PLAYED AT WOOLWICH, 13TH AND 14TH JULY.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
B. Atkinson, c Corbet, b Fowler	18	b Fowler	30
Bomb. Osmond, b Fowler	21	c and b Leslie	32
A. Hinde, b Fowler	0	c Banner, b Fowler	6
Major Curteis, b Fowler	17	c Lewis, b Fowler	17
Capt. King, st Lewis, b Fowler	22	b Corbet	16
Capt. White-Thompson, c Lewis, b Corbet	19	b Fowler	0
E. L. Tomkins, b Corbet	0	not out	63
L. M. Wilson, b Leslie	32	b Gibbs	20
Capt. Slee, c Lewis, b Webbe	49	b Webbe	38
K. St. G. Kirke, not out	0	not out	111
E. G. Waymouth, b Webbe	0		
Extras	32	Extras	34
Total	210	Total (8 wickets)	367

HARLEQUINS.

T. Herbert, b Hinde	25
G. Fowler, c Waymouth, b Osmond	37
C. F. H. Leslie, b Hinde	70
W. E. T. Bolitho, c Tomkins, b Kirke	29
A. J. Webbe, not out	158
B. D. Bannon, c Tomkins, b Kirke	1
C. R. Seymour, b Kirke	47
J. A. Gibbs, b Waymouth	33
H. D. Corbet, b Osmond	0
J. Robertson-Walker, c Slee, b Kirke	20
R. P. Lewis, c Tomkins, b King	29
Extras	28
Total	477

ROYAL ARTILLERY *v.* LINTON PARK.

PLAYED AT LINTON PARK, 15TH AND 16TH JULY.

ROYAL ARTILLERY.

A. Hinde, c Marchant, b Hamilton	13
B. Atkinson, c Marchant, b Hamilton	29
Captain Dorehill, c Tonge, b Champion	31
Major Curteis b Hamilton	26
Captain Slee, c A. Cornwallis, b Hamilton	8
Major Coker, c Blair, b A. Cornwallis	24
Captain Adair, c Warner, b Hamilton	30
K. St. G. Kirke, b Tonge	4
Captain Staveley, c and b Marchant	19
C. A. Sykes, b Tonge	1
E. G. Waymouth, not out	21
Extras	11
Total	217

LINTON PARK.

J. N. Tonge, c Curteis, b Kirke	13
P. F. Warner, b Kirke	41
Captain Blair, not out	46
Major Friend, not out	17
F. Marchant, Capt. Hamilton, G. E. Champion, F. T. Welman, A. W. Cornwallis, F. Burra, F. S. Cornwallis did not bat.	
Extras	2
Total (2 wickets)	119

ROYAL ARTILLERY *v.* CAPTAIN BOWEN'S XI.

PLAYED AT WINCHESTER, 22ND AND 23RD JULY.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
Capt. Wynne, b Freemantle	30	b Bowen	4
Bombr. Osmond, c Elgee, b Bowen	21	c Deane, b Freemantle	0
Major Curteis, c Russell, b Bowen	8	c and b Russell	31
G. P. C. Blount, b Freemantle	37	b Freemantle	9
Bombr. Butler, b Freemantle	0	b Freemantle	18
W. E. Rumbold, b Bowen	9	b Bowen	42
Capt. Powell, b Freemantle	46	c Elgee, b Bowen	31
Capt. Slee, b Clowes	6	c Freemantle, b Bowen	10
F. E. L. Barker, b Freemantle	1	not out	0
Gr. Lumley, b Bowen	18	b Russell	4
Bombr. Windrum, not out	1	b Feeemantle	12
Extras	12	Extras	25
Total	189	Total	186

CAPTAIN BOWEN'S XI.

1st Innings.		*2nd Innings.*	
Major Clowes, b Blount	5	b Powell	8
Freemantle, l-b-w, b Osmond	27	b Butler	36
Major Crake, run out	22	c Wynne, b Powell	26
Major Kitson, c Blount, b Osmond	13	b Butler	6
Capt. Bowen, b Blount	5	c and b Blount	36
Capt. Russell, c Windrum, b Blount	28	b Powell	0
E. Elgee, b Butler	0	not out	51
R. Wombwell, b Butler	0	b Butler	3
C. Elgee, b Butler	7	b Butler	20
Capt. Whistler, not out	3	l-b-w, b Powell	9
Lieut. Deane, run out	0	b Butler	0
Extras	11	Extras	19
Total	121	Total	214

ROYAL ENGINEERS *v.* ROYAL ARTILLERY.

PLAYED AT WOOLWICH, 24TH AND 25TH JULY.

ROYAL ENGINEERS.

1st Innings.		*2nd Innings.*	
Capt. Hamilton, b Kirke	7		
Capt. Hedley, c Barnes, b Moorhouse	133		
Capt. Blair, b Hinde	37		
J. S. Liddell, b Holloway	37		
F. E. Turner, l-b-w, b Kirke	28		
S. D. Barrow, b Kirke	3		
G. O. Bigge, c Hinde, b Stanton	58	not out	53
M. O'C. Tandy, c Foster, b Stanton	52	not out	44
E. H. Rooke, b Moorhouse	0		
Capt. Druitt, b Moorhouse	0		
F. G. Guggisberg, not out	0		
Extras	20	Extras	10
Total	375	Total (for no wickets)	107

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
W. L. Foster, c Barrow, b Hedley	5	c Guggisberg, b Hamilton	4
C. C. Barnes, b Guggisberg	1	b Rooke	73
Capt. Dorehill, run out	52	b Rooke	67
Maj. Curteis, c and b Hedley	0	b Hamilton	3
W. O. Holloway, c Hedley, b Guggisberg	45	b Rooke	8
H. C. Moorhouse, b Hamilton	3	l-b-w, b Rooke	9
F. H. G. Stanton, b Hedley	1	c Blair, b Rooke	11
Capt. Adair, c Guggisberg, b Hamilton	41	run out	10
Capt. E. S. Cooper, c Hedley, b Guggisberg	7	c Bigge, b Hedley	3
A. Hinde, not out	18	not out	12
K. St. G. Kirke, b Hedley	29	b Rooke	12
Extras	33	Extras	34
Total	235	Total	246

NOTES

FROM

CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1897.

THE Subject approved by H.R.H. The Colonel-in-Chief for the "Duncan" Gold Medal Prize Essay, 1897, is as follows:—

"Coast Artillery Practice; how best to conduct it with a view to the requirements of actual warfare."

The Rules for the Prize Essays now read:—

The Annual Gold Medal, when awarded, to be accompanied by an *honorarium* of £20; the Silver Medal by an *honorarium* of £10.

The candidates must be Officers of the Regiment who are members of the R.A. Institution.

Officers are requested to confine their Essays to about 16 printed pages of the "Proceedings;" other things being equal brevity will count towards success.

The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each Essay must be *type-written* in triplicate. The Essays must be strictly anonymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the competition has been announced, and he will send the writers the money for their type-writing expenses.

The Committe will allow a sum of £1 for type-writing each Essay.

The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend:—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
3. That no Medal be awarded.

The names of the successful candidates will be announced at the Annual Meeting, and Medallists will be distinguished as such in all Lists, &c., issued from the Institution; and in the event of a University man gaining a Medal, a report of his success will be made to the University of which he may be a member.

The successful Essays will be printed and circulated to members by the Institution.

N.B.—The Committee draw particular attention to the paragraph in the Rules above on the subject of length of Essays; it is not difficult to discover the number of words in an average page of "Proceedings" matter, and so to keep an Essay within the 16 pages' limit.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below :—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

"The Shrapnel Fire of the Field Artillery" by Major-General Rohne. Translated by Colonel N. L. Walford, price 2s. 6d.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Notes of Lectures on Artillery in Coast Defence," by Major A. C. Hansard, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d.

Examination questions in (*c*), (*d*), and (*e*) set in the five examinations ending November 1895 :—

Captains (*c*) and (*d*) ... ... price 1s. 1d.
Lieutenants (*c*), (*d*) and (*e*) ... price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

THE R.A. Institution have copies of the undermentioned works bound in cloth, which can be bought by members at the price of 1s. each :—

Colonel Walford's Translation of Prince Kraft's Letters on Cavalry.
" " " " " " " " Infantry.

These are the copies as published in Translations with the "Proceedings" and should be useful to members who have joined since the date of their publication,

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MESSRS. GALE AND POLDEN have recently published in their Military Series "The Officer's Guide to Campaigning Equipment," by Lieutenant Dudley Seagrim, Royal Artillery.

The book is arranged in tables giving the following information :—

Personal and Camp Equipment for an Officer's Medicines.
Officers' Mess Camp Equipment.
" " List of Provisions.
Packing of Mess Stores.
Estimates for Officers' Messes.

The price, weight and best place to obtain every article are all clearly given and the book is one likely to be invaluable to any officer proceeding on active service.

It is published in a most convenient form, the only possible objection is the large number of advertisements bound up with it.

GIBRALTAR.

Red-hot Shot at Gibraltar.

The "*Jahrbücher fur die Deutsche Armee und Marine*" published in its September number an interesting letter dated 6th January, 1786, in which the credit of employing red-hot shot against the Spanish men-of-war during the siege of Gibraltar (1782) is claimed by the writer, one J. G. L. Schwebendiech. Schwebendiech was by trade a smith and found himself at Gibraltar in one of the three Hanoverian battalions under General la Motte's command; from his story it appears that the furnace and grate erected by the English would only heat 11 shot at a time and that it took 2½ hours to heat each batch; moreover, that the English gunners could not face the heat of the furnace and great difficulty was found in getting the hot shot off the grate to the mortars.

The Hanoverian proved to Captain Witham, R.A. his capacity for standing heat and was permitted to build a furnace and grate from which a constant supply of red-hot shot was obtained during the remainder of the siege.

The object of the letter was to obtain some reward for his services and was addressed to the former Chaplain of the Hanoverian brigade; it is pleasant to be able to add that he received a substantial pension, which he enjoyed till 1820.

OBITUARY.

2nd Lieutenant J. Casement, who died at Sheerness on 3rd September, 1896, was commissioned on 21st March, 1896.

2nd Lieutenant J. Dalyell died at Quetta on 5th September, 1896. He was first commissioned on 16th February, 1894.

Colonel F. Howard, whose death occurred at Shoeburyness on 9th September, 1896, was first commissioned as Lieutenant, 3rd March, 1865; became Captain, 20th September, 1877; Major, 1st January, 1884; Lieut.-Colonel, 3rd March, 1892 and Colonel, 3rd March, 1896.

Lieut.-Colonel J. Blades (retired), who died at Folkestone on 5th August, 1896, was commissioned from the ranks as Lieutenant, 1st April, 1860; became Captain, 25th August, 1877; Major, 17th, December, 1881 and retired with the hon. rank of Lieut.-Colonel, 16th September, 1882. Lieut.-Colonel Blades served during the Crimean campaign, 1854–5 and was present at the siege and fall of Sevastopol, medal with clasp: Turkish medal.

Colonel E. Lyons (retired) who died at Cannes, France, on 25th August, 1896, joined the Regiment as Lieutenant, 7th April, 1856; became 2nd Captain, 19th October, 1866; Captain, 5th July, 1872; Major, 14th April, 1875; Lieut.-Colonel, 14th April, 1882; Colonel, 14th April, 1886 and retired on retired pay, 29th November, 1893.

Lieut.-Colonel H. Vaughan (retired) died at Natal, South Africa, on 26th August, 1896. He was first commissioned as Lieutenant, 30th August, 1864; became Captain, 30th May, 1877; Brevet-Major, 29th November, 1879 and retired on retired pay with the hon. rank of Lieut.-Colonel, 27th September, 1882.

CRICKET 1896.

ROYAL ARTILLERY *v.* FREE FORESTERS.

PLAYED AT WOOLWICH, 31ST JULY AND 1ST AUGUST.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
H. M. Barnes, c Wauchope, b Fowler	5	b Hill	0
Bombr. Osmond, c Pearson, b Hill	12	b Hill	19
Capt. Adair, c Wauchope, b Fowler	5	c and b Asher	1
Major Curteis, b Hill	9	c Pearson, b Hill	0
Capt. King, b Asher	62	c Buxton, b Hill	5
R. A. Craig, b Pearson	14	b Hill	8
Capt. Slee b, Christopherson	14	st Headlam, b Hill	0
Major Coker, b Christopherson	1	b Fowler	15
Capt. Cooper, b Asher	4	run out	10
C. A. Sykes, not out	16	st Headlam, b Hill	9
Bombr. Butler, b Hill	8	not out	6
E. W. Davies, c Headlam, b Hill	12	c Christopherson, b Hill	3
Extras	26	Extras	10
Total	188	Total	86

FREE FORESTERS.

1st Innings.		*2nd Innings.*	
G. Fowler, c Cooper, b Butler	28	b Butler	2
V. T Hill, c Craig, b Barnes	11	b Sykes	83
Capt. R. P. Spurway, c King, b Butler	23	b Butler	8
R. H. Johnston, c Davies, b Barnes	1	b Butler	8
H. R. Blaker, c Coker, b Butler	0	run out	25
A. R. Buxton, c Cooper, b Butler	0	b Butler	5
A. G. G. Asher, c Cooper, b Butler	5	st Slee, b Barnes	21
A. R. Wauchope, b Butler	0	not out	80
R. B. Pearson, not out	11	c Adair, b Osmond	13
P. Christopherson, b Butler	1	b Osmond	2
H. W. Brougham, b Butler	0	st Slee, b Barnes	12
C. Headlam, b Butler	2	l-b-w, b Osmond	11
Extras	3	Extras	6
Total	85	Total	276

ROYAL ARTILLERY *v.* OXFORD UNIVERSITY AUTHENTICS.

PLAYED AT WOOLWICH, 3RD AND 4TH AUGUST.

ROYAL ARTILLERY.

1st Innings.		*2nd Innings.*	
W. L. Foster, c Page, b Quinton	73	c Evans, b Quinton	8
H. M. Barnes, c Briggs, b Stratton	24	c Briggs, b Quinton	13
Bombr. Osmond, b Henderson	18		
R. A. Craig, b Evans	5		
G. P. C. Blount, b Evans	0		
Capt. Adair, c Fort, b Evans	13	not out	9
K. St. G. Kirke, run out	17	b Quinton	2
Capt. Staveley, c Henderson, b Evans	10	c Page, b Quinton	17
Capt. Cooper-Key, c Henderson, b Corbet	51		
Capt. Slee, b Corbet	29		
Capt. Cooper, c Henderson, b Quinton	9		
C. A. Sykes, not out	0	b Evans	0
		b Quinton	0
Extras	24	Extras	8
Total	273	Total (6 wickets)	57

OXFORD UNIVERSITY AUTHENTICS.

1st Innings.		*2nd Innings.*	
C. E. Briggs, b Kirke	43	c Blount, b Kirke	42
A. Page, b Kirke	1	b Blount	21
Rev. J. E. Burrell, c Osmond, b Blount	9	c Adair, b Cooper-Key	24
T. B. Henderson, c Blount, b Kirke	14	c Barnes, b Adair	62
G. R. Hunt, b Kirke	12	c and b Adair	41
H. D. G. Leveson-Gower, c Blount, b Kirke	17	b Blount	11
J. M. Quinton, c Craig, b Blount	21	not out	10
A. H. Evans, b Kirke	4	c and b Adair	5
J. A. Fort, c and b Blount	3	not out	22
J. W. Stratton, not out	11	c Cooper, b Kirke	26
H. D. Corbet, b Blount	0		
E. D. Sedgwick, b Blount	0		
Extras	21	Extras	8
Total	156	Total (8 wickets)	*262

*Innings declared closed.

The following are the results and averages for the Royal Artillery Cricket Club, 1896.

Matches played, 15. Won, 3. Lost. 5. Drawn, 7.

Batting Averages.

Names.	Total Runs.	No. of Innings.	Times not out	Most in an innings.	Averages.
Capt. P. H. M. Dorehill	417	11	1	80	41·7
W. L. Foster	265	8	1	110*	37·85
H. C. Moorhouse	244	10	1	62	27·1
C. C. Barnes	282	11	0	73	25·63
Major F. A. Curteis	541	23	1	108	24·59
W. O. Holloway	212	10	1	45	23·55
K. St. G. Kirke	258	15	4	111*	23·45
H. M. Barnes	123	6	0	55	20·5
Capt. P. H. Slee	223	11	0	49	20·27
„ C. D. King	138	7	0	62	19·71
F. H. G. Stanton	149	9	1	52*	18·62
Captain H. R. Adair	271	22	6	45*	16·93
Bombr. Osmond	148	9	0	32	16·44
E. G. Waymouth	108	9	2	55	15·42
A. Hinde	107	10	2	33	13·75
Capt. J. G. E. Wynne	152	12	0	33	12·66
„ E. S. Cooper	158	15	1	51	11·28
C. A. Sykes	65	10	4	17	10.83

And 26 others who played fewer than 6 innings.

* Signifies not out.

Bowling.

Wickets were taken by bowlers as follows :—

K. St. G. Kirke	44 wickets.
H. C. Moorhouse	28 „
Bombardier Butler	24 „
W. O. Holloway	20 „
A. Hinde	19 „
G. P. C. Blount	16 „

And 5 others who took less than 10.

NOTES

FROM

CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1897.

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"Coast Artillery Practice; how best to conduct it with a view to the requirements of actual warfare."

The Rules for the Prize Essays now read:—

The Annual Gold Medal, when awarded, to be accompanied by an *honorarium* of £20; the Silver Medal by an *honorarium* of £10.

The candidates must be Officers of the Regiment who are members of the R.A. Institution.

Officers are requested to confine their Essays to about 16 printed pages of the "Proceedings;" other things being equal brevity will count towards success.

The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April.

Each Essay must be *type-written* in triplicate. The Essays must be strictly anonymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the competition has been announced, and he will send the writers the money for their type-writing expenses.

The Committe will allow a sum of £1 for type-writing each Essay.

The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend:—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
3. That no Medal be awarded.

The names of the successful candidates will be announced at the Annual Meeting, and Medallists will be distinguished as such in all Lists, &c., issued from the Institution; and in the event of a University man gaining a Medal, a report of his success will be made to the University of which he may be a member.

The successful Essays will be printed and circulated to members by the Institution.

N.B.—The Committee draw particular attention to the paragraph in the Rules above on the subject of length of Essays; it is not difficult to discover the number of words in an average page of "Proceedings" matter, and so to keep an Essay within the 16 pages' limit.

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Examination questions in (*c*), (*d*), and (*e*) set in the five examinations ending November 1895 :—

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Lithographic plates of Field Artillery Harness stripped and laid down for inspection, price for pair (lead and wheel), 1d.

THE R.A. Institution have copies of the undermentioned works bound in cloth, which can be bought by members at the price of 1s. each :—

Colonel Walford's Translation of Prince Kraft's Letters on Cavalry.
" " " " " " " " Infantry.

These are the copies as published in Translations with the "Proceedings" and should be useful to members who have joined since the date of their publication

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MESSRS. GALE AND POLDEN have recently published in their Military Series "The Officer's Guide to Campaigning Equipment," by Lieutenant Dudley Seagrim, Royal Artillery.

The book is arranged in tables giving the following information :—

Personal and Camp Equipment for an Officer's Medicines.
Officers' Mess Camp Equipment.
" " List of Provisions.
Packing of Mess Stores.
Estimates for Officers' Messes.

The price, weight and best place to obtain every article are all clearly given and the book is one likely to be invaluable to any officer proceeding on active service.

It is published in a most convenient form, the only possible objection is the large number of advertisements bound up with it.

R.A. ALDERSHOT CRICKET, 1896.

Batting Averages.

FIVE INNINGS OR MORE.

Names.	No. of Innings.	Times not out.	Most in an innings.	Total Runs.	Averages.
W. L. Foster	12	1	120*	429	39·0
Major Flint	9	2	101*	172	24·6
W. J. Elwes	14	0	102	334	23·8
C. E. Budworth	15	1	55	315	22·5
F. H. G. Stanton	7	0	42	158	22·5
Bombardier Ashdown	12	3	90	202	22·4
E. Radcliffe	5	1	36*	85	21·2
Major Tilden	6	1	67*	79	15.8
B. Vincent	5	1	32	63	15·7
C. C. Barnes	8	0	40	84	10·5
E. L. Wheeler	6	2	18	33	8·2
Major V. Hughes	6	0	23	44	7·3
R. MacMillan	6	0	9	15	2·5

* Signifies not out.

Bowling.

TEN WICKETS OR MORE.

Names.	Overs.	Mds.	Runs.	Wkts.	Averages.
C. E. Budworth	234	45	715	61	11·7
E. Riddell	53	10	189	10	18·9
W. L. Foster	86	10	328	14	22·0
Bombardier Ashdown	100	9	368	15	24·6
F. H. G. Stanton	89	19	296	11	26·9

LEITH FORT.

THE Czar of Russia's arrival at Leith on the 22nd September brought the fort into unusual prominence and turned it into a regular place *d'armes* for the time being, giving its little garrison—the 39th Company, Southern Division, R.A.—a good deal of extra work and distraction.

The Czar's escort, consisting of eight officers and 140 men and horses of the Scots Greys who had come all the way from Hounslow for the occasion, were quartered in the fort for five days. With a good deal of doubling up, accommodation was provided for all; a bed being found for each officer and man and a stall for each horse, within the fort which, having once been a Horse Artillery station, fortunately contained a number of old troop stables.

It was a pretty sight on a fine morning, the Greys marching into the fort, headed by their own band and that of the Inniskilling Dragoons; and on their marching out five days later we were sorry to say good-bye to them. All

ranks had agreed excellently and a great blank was felt in the Officers' Mess which reverted to its usual diminutive proportions.

The Colonel of the Greys and the O.C. the detachment both wrote very kind letters thanking the R.A. for what they had done, and the officers presented Major Boileau with a handsome silver cigar-case bearing a complimentary inscription.

On the day of the Czar's arrival the 39th Company were employed in firing Royal salutes from Edinburgh Castle—one for the Prince of Wales and two for the Czar.

On the 1st September, the officers R.A. headed by Colonel Alves, Colonel Rooke and General Chapman, gave a garden party at the fort, which was a great success, notwithstanding the rain which had been anticipated and allowed for. The decorations had been most artistically arranged by Mrs. Alves, and the hosts were fortunately able to secure the services of the Regimental Band which had been fulfilling a municipal engagement at Glasgow. Cavaliere Zavertal was present and conducted in his usual style to the gratification of an audience of about 250, who, despite the rival attractions of 'St. Partridge,' had managed to be present.

At some tactical exercises held near Edinburgh the other day, the 39th Company, R.A., manned four 64-prs. on the beach at Musselburgh and, carbines in hand, fired alternate salvos and volleys at imaginary warships at sea and troops of real cavalry on land—a novel *rôle* for Garrison Artillery.

The same Company carried out its Competitive prize firing at Inchkeith this year from 10-inch R.M.L. guns at a towed record target, and having been awarded a first-class Company prize, have now mounted the gold cross guns.

Early in September the Company also held its aquatic sports at Inchkeith in half a gale of wind with a high sea running; but, in spite of the ill-nature of the elements, the programme was steadily proceeded with; and General Chapman, who was present with a large party, afterwards wrote the C.O. a very gratifying letter, congratulating him on the pluck and endurance af his men. The comic event of the day was the competition for the Major's prize—a pig in a box at the end of a horizontal greasy pole. Its capture was not effected without causing considerable amusement to the audience; most of the competitors having affected fancy female costumes, clad in which they disappeared in the water the usual number of times and mostly head first.

An association styled "The Royal Artillery Edinburgh Association" has been founded for the benefit of pensioners and army reserve men, late of the Regiment, who are resident in Scotland. The Honorary President, General Chapman, occupied the chair at the first meeting and a good many other officers were also present. H.R.H. the Duke of Cambridge, as Colonel-in-Chief, has sanctioned the wearing of rosettes of the R.A. colours by the old soldiers belonging to the association.

On the 3rd October General Chapman held a review of veterans in the Queen's Park. There was a muster of about 500, all in plain clothes, and the display of medals, chiefly for the Crimea and Indian Mutiny, was very large. The regular garrison, consisting of the Inniskilling Dragoons, the 39th Company R.A. and the 1st Royal Scots, with the addition of some Volunteer Begiments, were present and marched past the veterans. In spite of its being a wet afternoon there was an immense concourse of spectators. The veterans were afterwards entertained at a supper by the Lord Provost of Edinburgh.

The racing season in Scotland was brought to a close on the 1st and 2nd October by the Musselburgh Meeting: the weather was on its best behaviour for the occasion and two capital days' sport resulted. The Inniskilling Dragoons very kindly entertained almost all the occupants of the private stand to lunch on both days, and on the second day their Regimental Band played in the enclosure.

KASHMIR.

A Few Notes on Fishing.

I have written the following notes in hopes they may be of use to some of my brother officers.

In Kashmir in the early reason up till May, "mahseer" and the "chirroo" or Kashmir trout are to be considered, later in the season till end of August, trout only. For the former and big species of the latter, Scott's No. 2 spoon (obtainable from most tackle makers in India) with single salmon gut, two to three yards, trace with two or three swivels, or Farlow's wire traces are best. For big mahseer, larger spoons with wire, not split rings, can be used; this, however, would probably only apply to "kinghal" where frog is really the best bait. The boatmen, as a rule, know the best places for mahseer and the fisherman finds the small trout by observation for himself thus:—He will see them chasing the small fry called chilwa along the edges of the bank. He should then get into his small boat with fly rod and, keeping a convenient distance from the bank, throw his fly (to be described later) either on mud of bank and pull it into the water where the commotion is going on, or as near to the edge as possible, and keep following up till the fish cease sporting. Good boatmen are needed, as in the current it is difficult to keep a uniform distance from the bank. I have tried all sorts of flies, but the only one which proved successful is of about the size depicted, dressed with carefully combed white soft cotton with same material as body; the ends of a Turkish-bath towel combed and brushed cannot be improved on. The body should be placed as in diagram. You may catch fish up to 3 lbs. by this method. In August 1890, at Hajun, one evening I got 36 fish weighing 37 lbs. and about the same next day. During the summer and early autumn a veil and gauntleted gloves should be worn, otherwise the mosquitos, from about 6 p.m. till after dark, will render fishing impossible. At Hajun also big fish were showing all over the river, but no bait would tempt them. About half a mile below, however, between an island and the right bank, trolling with a 1¼-in. copper spoon (similar to Scott's No. 2), I caught several varying in weight from 3 to 10 lbs. At Bannair trout in August and September are very plentiful and I believe also in April and May. The same or smaller spoon is useful, but in August 1890 a 1¼-in. quill minnow was more successful. Excellent gut for traces and casts can be obtained from Mr. Carswell, 90, Mitchell Street, Glasgow, and a set of Mr. Williams' (10, Great Queen Street, London, W.C.) detachable leads are most handy and useful. Neutral tint goggles should be taken for use in India to modify the glare on the water when the sun is low, there is a retired officer, R.A., who lost an eye from it. If wading has to be done, short trowsers without gaiters or putties are best and wet things changed for dry as soon as the fishing is over. For dead bait Archer's spinner and Luscombe's (Allahabad) chilwa tackle are excellent. Do not trust tackle made in Kashmir. I would again recommend fishermen to provide themselves with "The Angler's Hand-book," by Captain Lacy, B.S.C., published by W. Newman & Co., 4, Dalhousie Square, Calcutta, also "Tank fishing in India," by the Author of "The rod in India" (Thomas). The above works embrace most parts of India. For Ceylon, I have heard of good sport being obtained in the rivers there with a white (silvered) phantom minnow like that used on the Tay. Before fishing, place a gut trace in damp flannel for about 12 hours, gut apparently rotten often recovers by this process. Tackle should be kept in an air-tight tin box.

OBITURAY.

General Sir J. Abbott, K.C.B., died at Ryde, Isle of Wight, on 6th October, 1896. He was commissioned as 2nd Lieutenant in the Bengal Artillery 6th June, 1823; became Lieutenant, 28th September, 1827; Captain, 6th June, 1838; Major, 7th June, 1849; Lieut.-Colonel, 28th November, 1854; Colonel, 28th November, 1857; Major-General, 19th June, 1866; Lieut.-General and Colonel-Commandant, 27th February, 1877; and General, 1st October, 1877. General Sir J. Abbott served at the siege and capture of Bhurtpore, 1825–6 (medal); Punjab campaign, 1848–9; raised the population and defended the district of Hazara and occupied Marquella Pass—received thanks of both Houses of Parliament (medal, Brevet of Major); N.W. Frontier of India Campaign, 1852—operations in the Black Mountain (medal). He was nominated a C.B., 24th May, 1873; and K.C.B., 26th May, 1894; and was also 3rd Class Durr-i-Durani Order (Shah Shujah, Kabul).

Captain H. G. Birch, who died at Roscrea, Ireland, on 16th October, 1896, joined the Regiment as Lieutenant, 27th July, 1880; and became Captain, 1st July, 1889. Captain Birch served in the Egyptian Expedition, 1882 (medal and bronze star).

Major-General W. Tod Brown, C.B., whose death occurred at Exmouth on 30th September, 1896, joined the Bengal Artillery as 2nd Lieutenant, 12th June, 1846; became Lieutenant, 3rd March, 1853; 2nd Captain, 27th August, 1858; 1st Captain, 24th March, 1865; Major, 5th July, 1872; Lieut.-Colonel, 1st August, 1872; Colonel, 1st August, 1877; and retired with the hon. rank of Major-General, 16th October, 1878. Major-General Brown served during the Punjab campaign, 1848–9, including the passage of the Chenab at Ramnuggur and battle of Goojerat (medal with clasp); was Commissary of Ordnance in charge of Siege Train and Artillery Park during the Mutiny campaign, including the relief of Lucknow, battles of Cawnpore, Kala Nuddee, siege and capture of Lucknow, Rohilcund campaign and battle of Bareilly, with subsequent affairs (*Despatches*, Brevet of Major, C.B., medal with two clasps).

Lieut.-Colonel G. Dangerfield died at Edinburgh on 28th September, 1896. He joined the Madras Artillery as 2nd Lieutenant, 12th December, 1845; became Lieutenant, 12th April, 1852; 2nd Captain, 27th August, 1858; 1st Captain, 16th June, 1862; Major, 5th July, 1872; and retired with the hon. rank of Lieut.-Colonel, 1st August, 1872.

Colonel W. R. Gilbert, C.B., died at Bodmin, 17th October, 1896. He was first commissioned as 2nd Lieutenant, 16th December, 1831; became Lieutenant, 17th October, 1833; 2nd Captain, 4th April, 1843; Captain, 30th June, 1848; Major, 20th June, 1854; Lieut.-Colonel, 13th December, 1854; and retired on half-pay with hon. rank of Colonel, 13th January, 1855. He was nominated a C.B. (Civil), 9th May, 1855.

Colonel H. H. Murray, who died at Mussoorie, India, on 13th September, 1896, was first commissioned as 2nd Lieutenant in the Bengal Artillery, 12th December, 1857; became Lieutenant, 27th August, 1858; Captain, 10th December, 1867; Major, 4th October, 1877; Lieut.-Colonel, 16th January, 1884; Colonel, 16th January, 1888; and retired, 12th April, 1888. Colonel Murray served during the Afghan war, 1878–9 (medal).

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ROYAL ARTILLERY REGIMENTAL DINNER, 1896.

THE Royal Artillery Regimental Dinner was established in 1861 and from that date to 1895, the Duke of Cambridge, while holding the appointment of Commander-in-Chief as well as Colonel of the Regiment, has presided at the dinner every year. In 1896, the Duke of Cambridge took the chair for the first time as Colonel of the Regiment only. There was an unusually large attendance at the dinner as will be seen from the following table:—

Ranks.	1861 (First dinner).	1891.	1892.	1893.	1894.	1895.	1896
Field Marshal	...	...	...	...	...	1	1
General Officers	13	48	39	65	48	35	45
Colonels	36	23	24	33	24	28	36
Lieut.-Colonels	...	21	27	41	22	25	15
Majors	23	30	35	42	34	23	36
Captains	47	42	33	37	23	20	30
Subalterns...	15	9	6	19	11	3	18
Surgeons	2	...	...	...	...	...	...
Total	141	173	164	237	162	135	181

With the exception of the year 1893, the year 1896 shows a record attendance. The year 1893 was an exceptional one, as the dinner on that occasion was a welcome home to Lord Roberts, and the Duke of Connaught was invited specially as a guest.

The dinner in 1896 was photographed by Messrs. Fradelle & Young, of 246, Regent-street, from both ends of the room; the photographs were very successful, and the one taken from the end opposite to the band has been reduced specially for insertion in the "Proceedings," the copies being supplied by Messrs. Fradelle & Young at a nominal price. The key, which accompanies the photograph, will enable most of the officers present to be identified. It is possible that there may be one or two errors in the key, owing to officers having changed their places or from other causes; moreover, there are a few vacant places in the key, which it has been found impossible to fill up correctly, they have, therefore, been left blank.

The key may be obtained from the secretary R.A. Dinner Club, War Office, Pall Mall, at a cost of 6d.

The photograph may be obtained from the photographers at the following prices:—

12 × 10 inches on mount 21 × 17 inches { 5s. unframed. 10s. framed.

23 × 17 inches on mount 32 × 26 inches { 21s. unframed. 42s. framed.

List of officers R.A. who were present at the regimental dinner on 12th June, 1896 :—

Rank and Name.		Rank and Name.	
Field-Marshal	Roberts, Lord.	Colonel	Hutchinson, W. F. M.
General	Adye, Sir J. M.	"	Jones, T. J.
"	Arbuthnot, Sir C. G.	"	Keith, J.
"	Askwith, W. H.	"	Kingscote, H. B.
"	Biddulph, Sir M. A. S.	"	Lockhart, W. E.
Major-General	Bishop, H. P.	"	Molony, C. M.
Lieut.-General	Bruce, H. Le G.	"	Morley, C.
Major-General	Buckle, C. R.	"	O'Callaghan, D. D. T.
"	Burn, J. M.	"	Ollivant, E. A.
"	Clifford, M.	"	Sandham, W. H.
"	Courtenay, H. R.	"	Saunders, A. A.
"	Cumberland, W. B.	"	Saward, M. H.
General	D'Aguilar, Sir C.	"	Slade, F. G.
Major-General	Denne, L. H.	"	Spring, F. W. M.
"	Du Plat, Sir C. T.	"	Stewart, R. M.
"	Edmeades, H.	"	Stewart, J.
"	Elliott, E. D.	"	Stone, J. G.
"	Finch, W. J.	"	Stratton, J. H.
General	Gardiner, H. L.	"	Thomson, C. W.
Lieut.-General	Hay, Sir R. J.	"	Tollner, B. L.
"	Hills-Johnes, Sir J.	"	Torkington, H.
Major-General	Geary, H. L.	"	Trench, C.
"	King, A. B.	"	Wallace, R. H.
General	Le Cocq, H.		
Major-General	Lloyd, F. T.	Lieut.-Colonel	Dalton, J. C.
"	Mackenzie, R.	"	Davidson, W. L.
"	Magenis, H.	"	Denbigh, Earl of
"	Manderson, G. R.	"	Douglas, J. D.
"	Maurice, J. F.	"	Downing, C. M. H.
Lieut.-General	Markham, E.	"	Foote, F. O. B.
"	Nairne, C. E.	"	Griffiths, A. S.
Major-General	Newall, D. J. F.	"	Grubb, A.
"	Nicholson, S. J.	"	Loraine, F. E. B.
"	Nicolls, O. H. A.	"	Lyle, H. C.
"	Owen, J. F.	"	Macgregor, P. L.
General	Pipon, P. G.	"	Rainsford-Hannay, R. W.
Lieut.-General	Radcliffe, R. P.	"	Rotton, A.
Major-General	Ruck-Keene, J. E.	"	Uppleby, J. G.
"	Sandham, R.	"	Yorke, F. A.
"	Sladen, J. R.		
General	Smyth, Sir H. A.	Major	Allen, J. R. H.
Major-General	Stallard, S.	"	Aylmer, F. A.
General	Stirling-Hamilton, Sir W.	"	Baker, J. V. V.
Major-General	Trevor, F. C.	"	Balfour, W. E. L.
"	Tweedie, M.	"	Barlow, G. N. H.
"	Williams, A. H. W.	"	Blewitt, W. E.
		"	Boileau, A. C. T.
Colonel	Andrews, W. G.	"	Carter, A. H.
"	Bainbridge, E.	"	Challenor, G. R.
"	Bally, J. F.	"	Coxhead, J. A.
"	Barlow, W. R.	"	Craig, J. F.
"	Browell, E. T.	"	Dunlop, J. W.
"	Calvert, A. M.	"	Elmslie, F. B.
"	Carey, W.	"	Eustace, F. J. W.
"	Clayton, E.	"	Flint, E. M.
"	Dillon, Hon. R. V.	"	Frith, W. H.
"	Ditmas, F. F.	"	Hadden, C. F.
"	Gregory, W. V.	"	Hansard, A. C.
"	Henry, G. C.	"	Inglefield, N. B.
"	Holley, E. H.	"	Leach, R. P.

LIST OF R.A. OFFICERS.—*Continued.*

Rank and Name.		Rank and Name.	
Major	Lindsay, W. F. L.	Captain	Jackson, C. S.
"	Lloyd, W. N.	"	Jenkinson, L. J. A.
"	Manifold, J. F.	"	King, A. D'A.
"	May, E. S.	"	Langley, J. P.
"	McCrea, R. F.	"	Lecky, R. St. C.
"	Newbigging, P. C. E.	"	Lloyd, M. B.
"	Newton, J. W. M.	"	Mackenzie, C. G.
"	Oakes, R.	"	Paget, W. L. H.
"	Phillimore, W. G.	"	Pollock, E.
"	Phillpotts, A. H. C.	"	Ravenhill, F. T
"	Porteous, J. J.	"	Ricardo, H. G.
"	Sclater, H. C.	"	Schofield, H. N
"	Simpson, H. C. C. D.	"	Smith, S. C. U.
"	Simpson, C. N.	"	Smith, H. G.
"	Smith, W. A.		
"	Stone, F. G.	Lieutenants.	Best, P. G.
		"	Butler, A. T.
Captain	Askwith, J. B. H.	"	Combe, K.
"	Askwith, H. F.	"	Corbett, R. C.
"	Birch, J. F. N.	"	Davies, E. W.
"	Campbell, E. A.	"	Drake, H. M.
"	Carleton, M. L.	"	FitzGibbon, J. A.
"	Churchill, A. B. N.	"	Hale, E. T.
"	Cleeve, F. J. S.	"	Hooper, S. H.
"	Cooper, F. E.	"	Goldie, M. L.
"	Connal, A. C.	"	Jennings, W.
"	Corbyn, H.	"	Kennard, A. M.
"	Du Boulay, N. W. H.	"	Lamont, J. W. F.
"	Du Cane, H. J.	"	McGildowny, W.
"	Fasson, D. J. M.	"	Roberts, H. B.
"	Henshaw, C. G.	"	Sandars, E. C.
"	Humphreys, G.	"	Sandys, W. B. R.
"	Hussey, A. H.	"	Smith, L. A.

The rules for the management of the dinner and the Dinner Club have been amended this year in accordance with the views of the majority of officers interested. They now stand as follows :—

(1). All officers serving, or who have served, in the Royal Artillery are eligible to attend the annual regimental dinner. Eligible to attend.

(2.) Officers actually serving, are eligible to become members of the Royal Artillery Dinner Club at an annual subscription of 5s., and an entrance fee of— Dinner Club, eligibility for membership.

(*a*) For 2nd Lieutenants ... ... nil.
(*b*) ,, ,, 5s. for every year of service up to three years.
(*c*) ,, Captains ... ... £1 0s. 0d.
(*d*) ,, Majors... ... ... £1 5s. 0d.
(*e*) ,, Lieut.-Colonels ... ... £1 10s. 0d.

The entrance fee and first annual subscription are payable on joining, and should accompany the notification to the hon. secretary that the officer wishes to become a member of the Dinner Club.

Subsequent annual subscriptions should be paid into Messrs. Cox & Co., Charing Cross, on the 1st January, to the credit of the Royal Artillery Dinner Club.

Cost of dinner.

(3.) Until further notice the price of the dinner will be:—

	£ s. d.
For subscribers (members of Dinner Club)	0 13 0
,, non-subscribers	1 12 0

Payment for the dinner should be made to the hon. sec. at the time intention to dine is notified, or in any case not later than three days before the date of the dinner. Officers who bank with Messrs. Cox & Co. are informed that the price of the dinner will be charged in their accounts.

Notification of intention to dine.

(4.) Notification of intention to dine should be made to the hon. secretary as early in June as possible, if notification is not *received* two clear days before the date of the dinner an extra payment of 5s. will be required. Withdrawal of names of officers unavoidably prevented from dining should be effected two clear days before the date of the dinner, as after that time no money can be refunded.

Arrangement of seats.

(5.) (*a*) It is particularly requested that officers will inform the hon. secretary as early as possible, if they wish seats reserved for themselves and their friends, and the position they would prefer: it should be noted that the arrangement of seats beforehand is by far the best plan, both in the interests of the officers dining and of the secretary, as it enables the latter to meet the wishes of officers in a manner which would be impossible if the allotment of seats be left to haphazard arrangements at the last.

(*b*) Generally speaking, applications for seats will be dealt with in the order in which they are received, and must be received two clear days before the dinner.

(*c*) When any number of officers wish to sit together, applications must be received from *each* member of the party; otherwise confusion is apt to occur owing to the same officer being possibly included in two parties, without his knowing it.

(*d*) General officers and colonels-commandant will be placed in order of regimental seniority, alternately to the right and left of H.R.H. the Colonel of the Regiment, unless they arrange otherwise with the hon. secretary.

(*e*) A plan of the table can be seen at the War Office until two days before the dinner: the day immediately preceding the dinner will be occupied in filling in the names of officers opposite the seats allotted to them, and in preparing two copies of the plan so completed, one for the dining-room and one for the ante-room, to be placed in the Whitehall rooms by 2 p.m. on the day of the dinner.

(*f*) Officers are particularly requested not to change their seats, after the official cards have once been put in the allotted places on the table, without communicating personally with the hon. secretary or his clerk. Much difficulty has been caused by officers leaving the official cards in the allotted places and, at the same time, putting their own visiting cards in other places; the result being that it has appeared as if an insufficient number of seats were provided.

(*g*) Officers who have not previously arranged with the hon. secretary for seats, can secure any vacant seats by placing their visiting cards at the required places on the table after 3 p.m.; but it is essential that no cards be put on the table, unless the officers whose names are on the cards, are certain to occupy the seats, otherwise the same difficulty will be experienced as explained in (*f*) above.

(6.) The band will not play *during* dinner, but will withdraw after playing "The Roast Beef of Old England," and come in again in time to play "God Save the Queen" after the first toast; selections will then be performed between the toasts and speeches. Band.

(7.) The accounts can be inspected at the War Office by any officer of the Regiment, and any suggestion which may be received in connection with the general management of the dinner and the dinner funds, will be brought forward by the hon. secretary for discussion at the annual meeting, which is held at the United Service Institution on the day of the dinner. Accounts and general management

The following table shows the number of officers who have joined or withdrawn from the Royal Artillery Dinner Club between the years 1891 and 1896, the majority of the withdrawals are due to the names of deceased officers being struck off the list:—

Year.	Joined.	Withdrawn.	Increase.	Decrease.	Net Increase.
1891 ...	15	6	9	...	...
1892 ...	6	7	...	1	...
1893 ...	16	14	2	...	...
1894 ...	2	1	1	...	...
1895 ...	3	12	...	9	...
Total 1891-95	42	40	12	10	2
1896 ...	41	10	31	...	31
Grand Total	83	50	43	10	33

Total number of members up to July 1895	266
Net increase in 1896	31
Grand total of members up to July, 1896	297

From the above figures it will be seen that the membership was practically stationary on the totals of the five years preceding 1896, but that in this year a great accession of numbers has been obtained. It is hoped that this accession of numbers may be repeated in 1897; and if it should continue, the price of the dinner for members can be further reduced.

War Office, Pall Mall,
22nd Oct., 1896.

F. G. Stone, Major,
Hon. Sec. R.A. Dinner Club.

RED-HOT SHOT.

THE interesting note from Gibraltar on red-hot shot (*vide* "Proceedings" R.A.I. October, 1896) has induced me to send the following note on the same subject:—

In my possession is a faded *MS.* report of an experiment with red-hot shot carried out by Major James Wood, R.A. (Kane's List, No. 209), dated Portsmouth 9th May, 1785. The trial was ordered by the Duke of Richmond, the then Master-General of the Ordnance.

The Gun used was a 32-pr. and the Target, intended to "represent the side of a 74-Gun Ship," measured "10 Feet Square and 2 Feet 3 Inches thick at the Bottom, and 2 Feet 1 Inch at the Top. The Weight of which was near Four Ton."

Details of drill with hot shot are recorded in Major Wood's handwriting:—

"No. 1.—Tries the Gun with a Wad-hook, Spunges, rams home, assists to run up."

"No. 2.—Puts the Cartridge and Wad into the Gun, assists to run up and helps to bring the Shot from the Grate and puts them into the Gun, and carry the bearer to the Grate when he goes for another Shot."

"No. 4.—Assists to run the Gun up, brings Shot from the Grate."

"No. 5.—Fetches Cartridges and Serves No. 2. with Wads."

"No. 6.—The N.C. Officer Fires and superintends the whole."

"A. and B. attend the Grate only, to keep the fire in and give the hot Shot to the Carriers."

"A tub fil'd with water near the Grate to cool the tongues and soak the Wads in."

"Spunged with a wet spunge."

"Dry Wad next the Powder after which is a Wet one next that & Spunged wet Sponge."

"Wad well soak'd in water, when taken out of the Tub it must be beat with a handspike or wooden mallet till no water will drain out, and examined with a Guage to be Sure that it will go down the Cylinder."

Notwithstanding the precautions contained in the drill, practice with red-hot shot was dangerous for the loading numbers. Captain Spilsbury relates, in his diary of the great siege, how, at least, one gunner lost his life and others were wounded by the hot shot causing premature explosion of the charge (*vide*

" Proceedings " R.A.I., Vol. XXII.). This siege of Gibraltar is generally alluded to as that of 1782, but it should not be forgotten that it lasted three years, seven months and twelve days. If Inkerman is remembered as the infantry soldier's battle, surely the Garrison Artillery can claim this fight as one of their very own.

It is not surprising to find that other nations adopted the means of pouring that which Carlyle called " torrents of red-hot iron " on their enemy's craft.

In Clarke & McArthur's " Life of Nelson " are the plans of the celebrated tower of Martello (the garrison of which beat off with only one gun the joint attack of the *Agincourt*, line of battle-ship and the *Fortitude*, frigate, in 1795).

In these drawings will be seen the grate and bellows for heating round shot. It is curious to note that this famous tower only surrendered after a two-days' cannonade from a commanding position on the land side upon which the heavy gun could not train to reply. The capitulation was eventually brought about by firing red-hot shot into it and so setting fire to the inner lining of the parapet which was made of bass junk.

The corresponding member at Gibraltar, no doubt, has good reason for stating that red-hot shot were fired from mortars. Drinkwater says guns and so near were the ships moored to the batteries that little or no elevation was required.

I thought that the only occasion upon which a hot shot was placed in a mortar was that, when a Royal salute was fired by the unaided efforts of one gunner, he placed a red-hot shot in the bore of a mortar and pitched cartridges into the muzzle from a respectful distance until the required number of explosions had taken place.

F. M. L.

PORTSMOUTH.

Amongst the recent changes in the officers here are 2nd Lieuts. Despard and Collen to the Field Artillery and they have been replaced by 2nd Lieuts. Deshon and Gilpen; Collen is a great loss to our cricket team here, especially in bowling.

The football team is doing very well, it having passed through two qualifying rounds for the English Cup, and it is now at the head of the Hampshire League. They played their first tie in the Army Cup against the Royal Sussex Regiment at Portsmouth on Oct. 29th and won somewhat easily; up to then they had scored 33 goals to 3.

2nd Lieuts. Mitchell, Johnstone and Gayer are attached here for instruction.

The men of two of the companies here will shortly be moved into Clarence Barracks, leaving three companies in Cambridge Barracks.

Colonel Wynne handed over the command to Lieut.-Col. Crookenden on Oct. 29th.

Capt. Morrison was second for the Captain's cup at the United Service Golf Club, at Haslar, on Oct. 24th.

Our cricket team here did well last season, the most successful members of the team being Bignell, Corp. Harms, Br. Meggs in batting, and Collen Holbrooke and Corpl. Harms in bowling.

OBITUARY.

COLONEL WALTER RALEIGH GILBERT, C.B., *late* R.A.

THOUGH the subject of this brief memoir left the Royal Artillery so far back as 1857 and for the last 40 years has been living quietly in Cornwall, where he discharged important duties up to the last, and therefore was not much *en évidence* at or near Woolwich where he was once so well known, still there are yet some officers serving or retired who will remember Capt. Gilbert as the smart and efficient Adjutant of the Horse Brigade at Woolwich, and they will without doubt agree that the close of the career of a man who reflected honour on their Regiment, both during and after his service in it, deserves more than a mere mention in the "Proceedings."

Walter Raleigh Gilbert was born at Menheniot Vicarage, Cornwall, on April 9th, 1813, of an old and distinguished Cornish family, one of his ancestors being Sir Humphrey Gilbert, knighted in 1557, the discoverer of Gilbert's Straits and distinguished as a navigator, being a half brother of Sir Walter Raleigh, whence the name since borne by several generations of the Gilbert family. His father was the Rev. Pomeroy Gilbert, Vicar of Menheniot and Prebendary of Exeter Cathedral. An uncle, Lt.-General Sir Walter Raleigh Gilbert, did good service in India in the Campaigns of 1803-4, 1845-6 in the Sutlej, and 1849 in the Punjab, for the last of which he was made a Baronet and G.C.B., and received other honours. The services of the late Col. Gilbert (No. 1796, Kane's List) in the Royal Artillery were briefly detailed in the obituary notices of last month's "Proceedings."

He was unfortunate in not seeing active service, and the writer of this memoir understood from him that his not being able to get out to the Crimea disheartened him so much, that it had a good deal to do with his decision to leave the Regiment and accept the important appointment of Chief Constable of the county of Cornwall, which he entered on (as the first occupant of the post) at Christmas 1857. This post he only relinquished when death claimed him on October 17th of this year (the anniversary of his commission as 1st. Lieut.) after a long and conspicuously useful life. No man in the county has been held in greater respect and affection by all those he came in contact with, and few public servants deserved better of their country.

The County Constabulary of Cornwall have been brought by Col. Gilbert to a great pitch of excellence, and his tact and firmness in dealing with the few cases of serious disturbance which have occurred in the county during the last 40 years have invariably borne good fruit.

The late unhappy riots at Newlyn this spring between the Cornish and Norfolk fishermen entailed serious exertions and anxiety on the Chief Constable, but notwithstanding his advanced age he never spared himself, and there can be no doubt that his last illness, which dates from May 25th, when he returned home

from Newlyn, was in a great degree owing to the undue strain which was imposed upon him. His splendid constitution gave him strength to cope with this illness in an extraordinary way, and he bore it with the greatest fortitude.

Col. Gilbert took an active part in county matters generally, and though retired from the Royal Artillery, he remained a gunner up to the last. In 1860 he was appointed as the first Colonel of the Volunteer Artillery Brigade in Cornwall, now known as the 1st Cornwall Volunteer Artillery. His eminent soldierly qualities and professional knowledge gained during 25 years in the R.A. made him especially fitted for this post, and it was only in February of this year that he reluctantly resigned his command, and was almost at once gazetted to the honorary colonelcy of the corps. He was made a Civil C.B. by Her Majesty eleven years ago in recognition of his long and valuable services.

The corps of Volunteers which Col. Gilbert so ably commanded is a very large one, and is composed of eleven companies and one large detachment, all in different stations. The work of maintaining uniformity in so scattered a command and keeping it efficient required no inconsiderable amount of tact, judgment and energy. Col. Gilbert possessed all these and applied them with the happiest results. From 1827, when he became a Cadet at Woolwich, to 1896, when he handed over the command of his Volunteer Brigade, a period of 69 years, Col. Gilbert may be said to have been continuously in harness as an artilleryman.

He was a man of fine physique and handsome presence, and until his last illness had hardly known what it was to be on the sick list. He was much attached to the Royal Artillery, and subscribed to the Institution to the last, taking much interest in the "Proceedings." There was nothing he liked better than talking over his old Woolwich experiences with his friends in the Regiment. There is in his house a very striking picture of him in the splendid uniform of the Horse Artillery, before the Crimea War, and the Bodmin Board of Guardians possess another fine oil painting of him which was acquired by subscriptions.

Col. Gilbert married in 1848, Marianne Charlotte Isabella, daughter of Mr. William Peter, of Ashford, Crawley, Sussex, who survives him, and he leaves one son, the Rev. Walter Raleigh Gilbert and three daughters.

He died at his own family place, The Priory, Bodmin, surrounded by his family, on Saturday, 17th of October, 1896 and was buried with every possible sign of love and affectionate respect at Bodmin, on Wednesday, October 21st.

J. C. D.

Lieut.-Colonel A. J. Anderson (retired), who died in London 3rd November, 1896, joined the Regiment as Lieutenant, 1st July, 1861; became Captain, 10th October, 1874; Major, 29th November, 1881; and retired on retired-pay with the hon. rank of Lieut.-Colonel, 5th December, 1888.

Major-General J. L. Bolton (retired) died at La Chasse 26th October, 1896. He was first commissioned as 2nd Lieutenant, 18th December, 1845; became 1st Lieutenant, 26th May, 1846; 2nd Captain, 18th February, 1854; Captain, 23rd February, 1857; Major, 6th July, 1867; Lieut.-Colonel, 30th September, 1868; Colonel, 1st October, 1877; and retired with the hon. rank of Major-General, 17th April, 1878. Major-General Bolton served in the Crimean Campaign 1854–55 and was present at the Siege of Sebastopol (medal with clasp and Turkish medal). Also during the Indian Mutiny, 1857–58 and commanded the Artillery in the action at Pertabghur (wounded—medal).

Lieutenant B. W. Holman, whose death occurred in London on 4th November, 1896, was first commissioned as 2nd Lieutenant, 25th May, 1892; and became Lieutenant, 25th May, 1895. At the time of his death he was A.-D.-C. to the Governor and Commander-in-Chief, Malta.

FRADELLE & YOUNG, PHOTOGRAPHERS, 246, REGENT STREET, LONDON,

The Annual Dinner of the Royal Artillery,

WHITEHALL ROOMS, HOTEL METROPOLE, LONDON, JUNE 12TH, 1896.

President .. Field Marshal H.R.H. The DUKE OF CAMBRIDGE, K.G.

MET

HALL, WHIT

H JUNE, 1

H.R.H. the Duke of Cambridge.

Genl. Askwith.

" Gardiner.

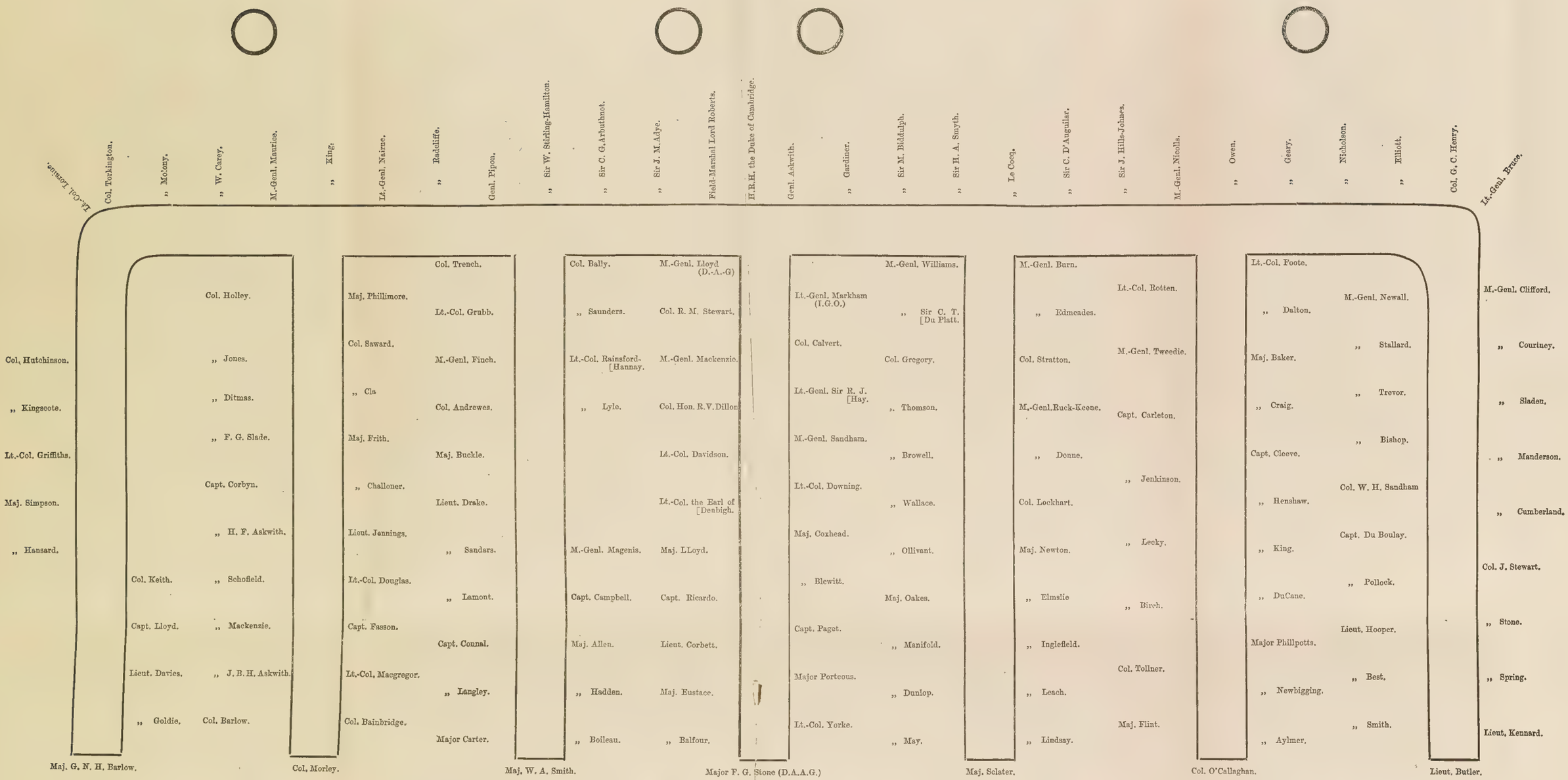
Lt.-Genl. Markham. Clifford.

HOTEL METROPOLE.

BANQUETING HALL, WHITEHALL ROOMS.

12TH JUNE, 1896.

ENTRANCE FROM RECEPTION ROOM.



PLAN OF TABLE.